Heavy Antiarmor Units – Integral Members of the Combined Arms Team or Obsolete Organizations?

A Monograph
by
Major John M. Peppers
Infantry

School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas

First Term AY 92-93

REPORT DOCUMENTATION PAGE

Form Approved
OMB No 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	01/93	MONOGRAPH

4. TITLE AND SUBTITLE
HEAVY ANTIARMOR UNITS - INTEGRAL MEMBERS OF THE COMBINED ARMS TEAM OR OBSOLETE ORGANIZATIONS?

5. FUNDING NUMBERS

6. AUTHOR(S)
MAJ JOHN M. PEPPERS, USA

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
SCHOOL OF ADVANCED MILITARY STUDIES
ATTN: ATZL-SWV
FORT LEAVENWORTH, KANSAS 66027-6900
COM (913) 684-3437 AUTOVON 552-3437

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

SEE ATTACHED SHEET

14. SUBJECT TERMS
ANTIARMOR
ANTITANK
TANK DESTROYER
COMPANY ORGANIZATION
BATTALION ORGANIZATION
MECHANIZED WARFARE
INFANTRY
IMPROVED TOW VEHICLE
CAVALRY FIGHTING VEHICLE

15. NUMBER OF PAGES
73

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNLIMITED

ABSTRACT

HEAVY ANTIARMOR UNITS - INTEGRAL MEMBERS OF THE COMBINED ARMS TEAM OR OBSOLETE ORGANIZATIONS? by MAJ John M. Peppers, 73 pages.

This monograph explores the US Army's position on the twentieth century warfare phenomena of armor versus antiarmor. From WWII through the end of the Cold War, debate over the degree to which antiarmor organizations have been necessary to conduct successful combined arms mechanized warfare, has been a major and divisive issue for the US Army.

This monograph focuses on the historical, theoretical and current aspects of that debate. US Army decisions on antiarmor material, organizational design and doctrine are reviewed. The monograph examines the record of the Antiarmor Company of the mechanized infantry battalion, from the late 1970s to today. Comparisons and contrasts are drawn with the historical and current antiarmor forces of the British, German and Russian armies. Emerging antiarmor trends and technologies are assessed. The monograph uses specific criteria derived from contemporary definitions of combined arms warfare and organizational design, to analyze the US Army's current and future need for heavy antiarmor companies.

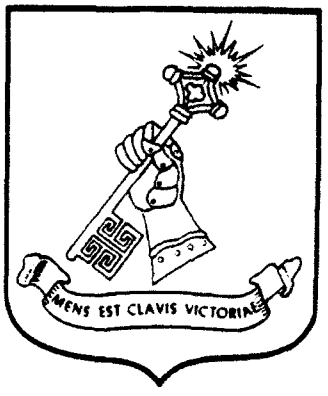
The monograph establishes that historically US antiarmor material, organizational design, and especially doctrine, have been frequently mismanaged. The monograph verifies that antiarmor warfare remains an inherent part of the modern mechanized battlefield. A theoretically derived and historically evidenced analysis establishes that a significantly higher level of combat power generation arms are possible with antiarmor organizations in the combined arms team. Finally the monograph concludes the Army's recent decision to retain and upgrade the material of the Antiarmor Company was the correct answer, but for the wrong reasons. Recommendations include changes to doctrine, Antiarmor Company design and structure.

Heavy Antiarmor Units – Integral Members of the Combined Arms Team or Obsolete Organizations?

A Monograph
by

Major John M. Peppers

Infantry



School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas

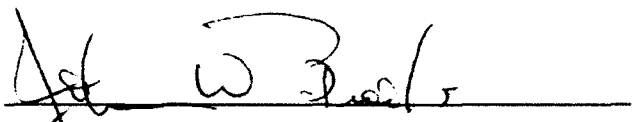
First Term AY 92-93

SCHOOL OF ADVANCED MILITARY STUDIES
MONOGRAPH APPROVAL

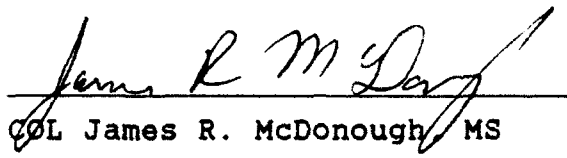
Major John M. Peppers

Title of Monograph: Heavy Antiarmor Units - Integral Members of the Combined Arms Team or Obsolete Organizations?

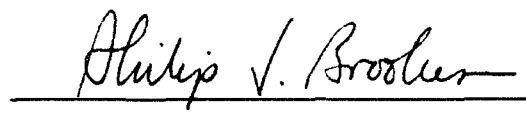
Approved by:



Monograph Director
LTC Johnny W. Brooks, MA



Director, School of Advanced Military Studies
COL James R. McDonough, MS



Director, Graduate Degree Program
Philip J. Brookes, Ph.D.

Accepted this 19th day of December 1992

ABSTRACT

HEAVY ANTIARMOR UNITS - INTEGRAL MEMBERS OF THE COMBINED ARMS TEAM OR OBSOLETE ORGANIZATIONS? by MAJ John M. Peppers, 73 pages.

This monograph explores the US Army's position on the twentieth century warfare phenomena of armor versus antiarmor. From WWII through the end of the Cold War, debate over the degree to which antiarmor organizations have been necessary to conduct successful combined arms mechanized warfare, has been a major and divisive issue for the US Army.

This monograph focuses on the historical, theoretical and current aspects of that debate. US Army decisions on antiarmor material, organizational design and doctrine are reviewed. The monograph examines the record of the Antiarmor Company of the mechanized infantry battalion, from the late 1970s to today. Comparisons and contrasts are drawn with the historical and current antiarmor forces of the British, German and Russian armies. Emerging antiarmor trends and technologies are assessed. The monograph uses specific criteria derived from contemporary definitions of combined arms warfare and organizational design, to analyze the US Army's current and future need for heavy antiarmor companies.

The monograph establishes that historically US antiarmor material, organizational design, and especially doctrine, have been frequently mismanaged. The monograph verifies that antiarmor warfare remains an inherent part of the modern mechanized battlefield. A theoretically derived and historically evidenced analysis establishes that a significantly higher level of combat power generation arms are possible with antiarmor organizations in the combined arms team. Finally the monograph concludes the Army's recent decision to retain and upgrade the material of the Antiarmor Company was the correct answer, but for the wrong reasons. Recommendations include changes to doctrine, Antiarmor Company design and structure.

Table of Contents

		Page
I.	Introduction	1
II.	Definition of Key Terms	3
III.	Antiarmor Units in the US Army	6
IV.	Antiarmor Units in Other Armies	19
V.	Emerging Antiarmor Trends and Technology	29
VI.	Comparison and Analysis	33
VII.	Conclusions and Recommendations	41
	Endnotes	43
	Bibliography	62

I. INTRODUCTION

The dominant trend of twentieth century warfare has been the battlefield mechanization symbolized by the tank. A subordinate theme of that phenomenon has been the ongoing struggle of tank versus antitank and armor versus antiarmor. This struggle has manifested itself in a wide array of weapon systems, concepts, doctrines and organizations. The US Army, and other leading armies of the world, have spent much energy and national treasure on this issue and continue to do so today. This monograph will address one aspect of the US Army's efforts in this area. It will examine the issue of the historical and contemporary need for antiarmor organizations, in order to conduct successful mechanized combined arms warfare.

The US Army's sound pre-WWII steps into antiarmor organizations were hurriedly expanded in 1941 and 1942 to address a major shortfall in capability. The result was the failed experiment with a separate branch known as "Tank Destroyers." The wartime performance of these antiarmor organizations, though often valiant, was deficient in combat materiel, and flawed in doctrine and organizational design.[1] The post-war assessment of effective combined arms performances in WWII led to the abandonment of the tank destroyer. Instead the Army addressed the antitank problem with an "all arms" solution, centered on the idea that the best defense against a tank is a tank.[2] In the three decades following WWII the US Army revisited the issue three times without adopting a fundamental change in policy. Meanwhile other armies adopted some significantly different approaches to antiarmor in the post-WWII and Cold War eras.

Following the impressive performance of antitank guided missiles (ATGMs) in the 1973 Yom Kippur War, the

US Army reconsidered the issue. One of the war's clearest lessons was the reiteration of the critical requirement for a balanced, combined arms approach to the modern battlefield.[3] The late 1970s divisional restructuring initiatives stressed smaller, single function combat arms companies to insure a more effective combination of arms at the battalion level. Initial proposals called for the reorganization of existing organic ATGMs into an antiarmor company in both mechanized infantry and armor battalions.[4] This period led to a resumption of debate over the need for antiarmor organizations in our Army. This monograph will focus primarily on the historical, theoretical and current aspects of that debate.

After the reorganizations to form the antiarmor company (also known as "Echo" company) the Army began fielding Bradley infantry fighting vehicles. Compared to the antiarmor company's Improved TOW Vehicle (ITV), the Bradley possesses near equal ATGM capability and far superior mobility and survivability. By the late 1980s the modernized heavy task force equipped with M1 Abrams tanks and M2 Bradley fighting vehicles became the Army norm.

Parallel to this development, the ITV-equipped antiarmor company began to come under mounting criticism as a slow, unwieldy and superfluous combat organization.[5] In the wake of mixed performance results during the Gulf War there have been calls for the Antiarmor Company's removal from the heavy force.

With post-Cold War budget pressures increasing, the US Army had to decide whether to: 1) remove the antiarmor company and redistribute the force structure savings, 2) retain the unit and upgrade it by either improving the ITV weapon platform or converting to another platform, or 3) maintain the unit while awaiting emerging antitank technologies such as the

Line of Sight Anti-Tank (LOSAT) system featuring the Hypervelocity Missile (HVM) or the Non Line of Sight - Combined Arms (NLOS-CA). The Army has recently chosen to proceed with the second course of action.

This monograph will argue that antiarmor warfare is an inherent part of the modern mechanized battlefield and that antiarmor organizations are important members of the combined arms team. The monograph will show that US antiarmor materiel, doctrine and organizational design have been historically mismanaged. It will compare the antiarmor efforts of other important post-WWII armies working through the same issues. Through these discussions the debate over Echo company will be examined. Finally the monograph will assess the Army's decision to proceed with the second course of action as the correct answer, but for the wrong reasons.

II. DEFINITION OF KEY TERMS

To address this complex issue a few terms must be commonly defined to allow comparison of antiarmor organizations of different times and places. Assessment criteria are derived from these definitions to support analysis of the key issues just introduced. The terms to be defined are: antiarmor organizations, combined arms, and organizational design.

Key to this monograph is a sound and clear delineation of the term antiarmor organization. The need for a specific, qualified definition indicates the growing sophistication of antiarmor warfare. Historically there were complications because the same weapons and organizations often performed multiple battlefield roles - to include antitank, surrogate artillery, or infantry supporting assault gun. Also the mechanization of all branches and arms has led to renaming former antitank weapons "antiarmor" based on

the more general targetry. Another source of confusion is the use of labels or names like tank destroyer. Generally acknowledged to be a tracked gun with tank-like armor protection, tank destroyer is loosely applied to everything from the first towed antitank guns to today's tracked ATGM weapon systems.[6]

Also air based units and those using an indirect flight path to the target, cannot be easily excluded. Noted military thinkers often subscribe a primary antitank role to attack helicopters.[7] Meanwhile top attack of vehicles with reactive armor is a technological breakthrough that makes the distinction between launch platforms increasingly moot. Examples include today's Hellfire missile and Copperhead artillery round.[8] Yet there is an inherent difference between these units and those on which this monograph primarily focuses.

For the purposes of this monograph antiarmor organizations will specifically mean those ground units organic to armor, mechanized and infantry divisions or lower, whose primary function is the destruction of enemy combat vehicles, especially main battle tanks. These units primarily organize around direct fire weapon systems including high velocity or kinetic energy guns and ATGMs. Once primarily towed weapons, these platforms are now motorized or, more commonly, mechanized and have some degree of self-protective armor. The intent of this definition is to encompass antitank weapon platforms of WWII, modern Soviet self-propelled and towed guns, as well as missile based units such as Echo company.

Equally critical is defining the term combined arms. The term is subject to many interpretations.[9] For this discussion the broadest definition is sufficient and FM 100-5 (Draft), dated 21 August 1992, defines it as, "the simultaneous application of several

elements of combat power into an integrated whole (such that) the combination of effects is greater than the sum of the individual parts."[10] FM 100-5 (Draft) states that combat power is the effect created by combining the four dynamics of firepower, protection, maneuver and leadership in a manner relatively superior to the enemy's efforts to do the same. It adds that when the physical strengths are equal, moral qualities of leaders and soldiers will win.[11]

This definition suggests criteria that are necessary to measure an organization's contribution to combined arms. Suitable comparisons become possible from an antiarmor organization's ability to apply firepower, provide protection and enhance maneuver in contribution to the combined arms unit's mission accomplishment. The critical leadership dynamic is a more independent variable, less suited to historical or national comparison. What can be compared is how the materiel, organizational design, and especially doctrine, facilitate the leader's integration of firepower, protection and maneuver into combat power.

Finally doctrine and materiel are clear terms but organizational design requires clarification. Thorough discussion of historical, current and future antiarmor organizations requires comment on their composition and their distribution within the tactical force. Major Glen Harned's 1985 monograph on the "Principles of Tactical Organization" provides some essential definitions. Force design is the detailed construction of a unit to conduct assigned battlefield functions. It is expressed by the Table of Organization and Equipment (TOE). This must be distinguished from force structuring, which is the balanced integration of a mix of TOE units into a larger organization capable of a given mission.[12] Harned's review of prominent theorists of organizational design led to two important

and fundamental principles governing tactical organization: economy of force and unity of effort.[13]

These two principles are necessary criteria for evaluating antiarmor organizations. Economy of force, defined in a substantively different way than the Principle of War, focuses on generating maximum combat power with a given set of resources. Unlike the current principle of war, the meaning orients on output:

> Economy, properly understood, does not mean getting along with the least possible, but getting the most out of what one has -- not a minimizing of effort, but a maximizing of results.[14]

Unity of effort is also an outcome - the generation of synchronized combat power - that the design and structure of the tactical organization must produce. The force designer achieves unity of effort by building in the capability (organic), or by structuring the force to make it available via a command relationship (attachment, OPCON) or a cooperation and coordination relationship (such as direct support).[15] These two principles complement and balance each other. One defines a minimum required level of effect from the given resources. The other demands that this effect can be harmoniously produced with ease. These two organizational design criteria facilitate comparison of antiarmor units.

III. ANTIARMOR UNITS IN THE US ARMY

WORLD WAR II-

In the late 1930s the US Army's first efforts with antitank organizations included good work in organization design and doctrine.[16] Despite this favorable beginning our WWII experience with antitank organizations was a failure on those same points - severely flawed doctrine and inefficient organizational design. The manifestation of these flaws was a reduced

ability to generate combat power in relation to the enemy.

Any discussion of our antiarmor organizations in WWII largely covers the too rapid rise and ignominious decline of the Tank Destroyer service. The history of this short-lived arm is captured in Leavenworth Paper No. 12 Seek Strike and Destroy: US Army Tank Destroyer Doctrine in World War II by Dr. Christopher R. Gabel. Tank destroyer doctrine called for massing battalion and larger antitank formations in order to seek massed enemy tanks aggressively. Gabel's central finding is that the doctrine was based on:

> an imperfect understanding of combined arms mechanized warfare and thus created a doctrinal solution for a problem that did not exist as perceived.[17]

The tank destroyer idea was adopted in the wake of stunning German blitzkrieg successes over the Allies in 1940 creating, "an exaggerated fear of the tank" and an obscured view of the combined arms nature of the fight.[18] The problems of branch parochialism on antitank matters and the skewed results in favor of antitank units in the 1941 Louisiana and Carolina maneuvers, led to the establishment of the new Tank Destroyer arm.[19] By war's end frustrated commanders and one of the Army's top tank destroyer instructors, British Lieutenant Colonel Geoffrey D. W. Court, impugned the doctrine and the separate branch. Court taught at the Tank Destroyer Center at Camp Hood for the last half of the war. In 1946 he wrote, "the theory that antitank guns of any caliber can operate independently of other arms has been exploded as being unsound."[20] Court viewed a separate antitank branch as dysfunctional.[21]

The performance of antitank combat materiel offered mixed results. Some observers have gone so far to say the only US antitank weapon development of note during

the entire war was the bazooka.[22] During first combat in 1942 infantry regimental antitank companies, as well as early tank destroyer units, were equipped with ineffective 37mm towed guns.[23] Later it was replaced with the 57mm towed gun that was also obsolete by 1944.[24] Serious doubts about the firepower and protection capabilities of these units led to dispersal of self-propelled tank destroyers and tanks to do this basic function.[25]

The debut of the self-propelled tank destroyer in North Africa was also poor, "they lacked mobility and effective penetration power, the very characteristics that they were supposed to maximize."[26] Then some favorable British results with towed antitank were misinterpreted. Just as effective US self-propelled models like the M18 came available, the Army mandated that half the tank destroyer force remain towed.[27] These missteps hurt commander's perceptions of antitank forces in general and intensified use of tanks in other than their primary role.[28] In the realm of materiel, US Army antiarmor firepower, "failed to anticipate the advances in tank armor and armament that would occur as the war continued."[29]

In the realm of organization antitank units were designed well, but suffered serious problems in force structure. Despite their inferior weaponry the infantry battalion and regimental antitank units were adequately designed, particularly the armored infantry battalion.[30] One author compliments tank destroyer battalion designs as "combined arms" organizations, primarily because they included a reconnaissance company, infantry security and antiaircraft sections.[31] But the doctrine called for independent employment against enemy formations, and that required a very robust combination of arms, tank destroyer units lacked adequate artillery and infantry.[32]

On the larger issue of where these antitank forces would be needed, the force structure philosophy of Lieutenant General Leslie J. McNair, officer in charge of Army Ground Forces came into play. Specifically McNair believed in pooling specialized assets, like tank destroyers and antiaircraft units, at Corps or Army level.[33] This philosophy, and the doctrine for massing tank destroyers, ushered in a decision to eliminate divisional antitank battalions. This left the ineffectively armed regimental antitank company as the only organic antitank asset on the division combined arms team.[34] The Commander of the Tank Destroyer Center unsuccessfully opposed this.[35] Under the pressures of combat, the inadequacies of infantry antitank units insured that tank destroyers were routinely required to support divisions, often employed in piecemeal support of regiment and lower levels.[36]

In summary, WWII US antiarmor organizations were periodically deficient in firepower, often suspect in their protective role, and rarely contributed to the combined arms team maneuver dynamic. Antiarmor organizations emerged as failures from WWII due to faulty doctrine and mismanaged organizational design. Despite minor successes in force design, the failures of force structuring antiarmor organizations at the wrong levels had greater impact. The understanding that an effective antiarmor capability was a continuous requirement for division and lower combined arms battle came too late. This force structure error seriously impeded achieving unity of effort. Along with ill conceived antitank doctrine this forced US combat leaders to find their own solutions. Inevitably they were drawn to the effective but limited solution of using tanks in other than their primary role of offensive shock action.

POST WWII TO 1973-

In the aftermath of WWII the US Army reviewed the record of combat power generation and determined the best results had come from a team built around the twin pillars of infantry and tanks.[37] The view was that:

> As the tank destroyer approached the tank in terms of size, expense and manpower, it was no longer the "economical" means for killing a much more expensive tank envisioned by McNair. The tank destroyer could no longer be justified in terms of economy, while the tank was now a multipurpose tank killer, infantry support weapon, and tool for exploitation and pursuit.[38]

Indeed the basic premise was that, "the medium tank is the best antitank weapon."[39] This assessment was only occasionally, and never resolutely, challenged over the next 38 years.

The late 1940s manifestation of this assessment was a tank battalion per division and a tank company per regiment to do antitank and infantry support missions.[40] The primarily infantry and artillery war in Korea was fought with this organization. At war's end the Army simply assessed that existing combined arms doctrine remained valid.[41]

As the US Army reshaped itself for atomic warfare in the 1950s the antitank question continued to receive the same answer. Both sides shaped their plans on the premise that the tank was the best protection against the challenges of an atomic battlefield.[42] This era included consideration of two developments in antiarmor, the recoilless rifle and the guided missile.

The recoilless revolution had first touched the Army at the end of WWII, but it was the USMC's novel use of the 106mm weapon that nearly led to organizations larger than antitank platoons and sections.[43] The relatively inexpensive ONTOS system mounted two to six 106mm recoilless rifles on a light tank chassis. Project Vista envisioned it as the primary antitank weapon for the Army and USMC.[44] As

the ONTOS proved unwieldy, the tank's next challenger was a first generation guided missile known as DART.

The Pentanna study of Army pentomic era force structure, proposed DART as an antitank asset organic to each of the five battle groups.[45] DART represented an alternative to the more tenuous support offered by divisional pooled tank organizations. Armor School objections to the plan, and the decision to skip first generation guided missiles, kept DART from more serious consideration.[46] The result was a return to pooled assets with a divisional tank battalion of five tank companies. In the Pentomic division the tank continued to perform multiple roles.[47]

As the Army adopted the Reorganization Objectives Army Division or ROAD structure in the 1960s, the basic antiarmor philosophy was unchanged.[48] This held true for the decade-long Army immersions in the twin ventures of counterinsurgency and airmobility, and only began to give signs of change around 1972.[49] US efforts to produce second generation guided missiles, had been worth the wait. The economic and efficient Tube-launched, Optical-tracked, Wire-guided missile (TOW) proved quite successful in the closing days of Vietnam.[50] This development sparked calls for mounting this antiarmor weapon on tracked vehicles and integration into the combined arms team. For the first time in four decades, serious debate about antiarmor organizational design resumed.[51]

The Army's post-WWII move to the "multi-role tank" to answer the problems of antitank and infantry fire support, is understandable. A doctrinal basis for antiarmor warfare built around tank/infantry cooperation is adequate. Yet it remains less complete than the fullest combined arms teams of WWII, which included antitank forces.[52] In essence US economic and efficiency analysis said that:

> In contrast to the perceptions of other nations of the world the US had concluded, in effect, that it could manufacture a tank that could outshoot and outmaneuver other tanks of the world.[53]

The result was the Army did not seriously pursue other antiarmor materiel developments for 25 years. Organizationally, only inadequate antiarmor units were in the mechanized infantry battle groups or battalions.[54]

Throughout this period the trade-off between armor's best use in a primary offensive, shock action role and continuance of infantry support and antitank roles, was debated.[55] The Soviet drive for mechanization of all arms, the arrival of the first multi-role infantry fighting vehicle in the BMP, and the rising cost of main battle tanks seemed to demand a new solution.[56] What had been sufficient combat power for Korea or the early Cold War, might not be against a Soviet war machine attacking through central Europe in the 1970s. It would take a revolution in US organizational design to solve this issue properly.

'73 WAR TO AIRLAND BATTLE-

The Arab-Israeli war of October 1973 served as a wakeup call for the US Army. The October War showed the complexities of modern combined arms warfare. Particularly important were the criticality of readiness in a "come-as-you-are" war and the unparalleled lethality of modern weaponry.[57]

The Israeli Army had slipped into the poor practice of employing tanks alone, without infantry or artillery. Egyptian defensive formations, reinforced with three times their normal complement of ATGMS, severely mauled the susceptible Israeli tanks.[58] Initial reports stressed these losses. Further analysis revealed most tank losses were still to other tanks.[59] It was too soon to call the tank or the Israeli style blitzkrieg extinct.[60]

The war had, "confirmed some of the notions about combat," held by General William E. DePuy, Commander Training and Doctrine Command (TRADOC).[61] Central to Depuy's conception of combined arms warfare were beliefs in the primacy of the tank in the offensive, shock action role and the centrality of armor and antiarmor warfare to the mechanized battlefield.[62] These ideas became the basis for the 1976 FM 100-5 and the doctrine of active defense, which in turn drove a parallel revolution in US organizational design.

As Depuy's attention turned to restructuring the force, his emphasis was on single weapons companies and fostering effective combinations of arms at the battalion level. This included a new ATGM company in the mechanized infantry and armor battalion.[63] From June 1976 through December 1979, TRADOC conducted a series of structure studies, wargames, simulations and field tests under the heading of Division Restructuring Study and Evaluation. Each study recommended the ATGM company be included in the mechanized infantry and armor battalions. A typical recommendation was:

> The TOW weapon system offers significant advantages to the tank battalion; the anti-tank company in the tank battalion was a plus by all measures of effectiveness and is a potential addition to H-series units pending further validation during brigade testing and division level analysis.[64]

Voices in the armor community urged the same.[65] During this process TRADOC command passed to former Armor School Commandant, General Donn Starry. By early 1979 TRADOC had deleted the antiarmor company from both types of battalions. Only with the influence of ex-TRADOC commander General Depuy was it reinserted in the Division 86 architecture, as Echo company for the mechanized infantry battalion.[66]

Even as the new Echo company began to take the battlefield the tactical concept on which it was based began to change. By 1980 the Army had reconsidered

active defense based on perceptions that it was too firepower-attrition oriented.[67] Beginning with a 1981 Airland Battle concept paper, and culminating in a 1982 version of FM 100-5, the Army revised the tactical concept. This major revision stressed leadership, maneuver and projected a battlefield, "no longer characterized by distinct area lines but by a rapid movement and intense volumes of fire."[68] The Army doctrinally anticipated the 1980s modernization that featured multi-role combat vehicles and a sharp increase in the capabilities of tactical units. Chief among these were the additions of the M1 Abrams tank and the M2 Bradley infantry fighting vehicle (BFV).

Materielly Echo company's TOW weapon platforms were from the previous generation of vehicles in terms of drive train, armor protection and cross country speed. Fielding of the M901 Improved TOW Vehicles did not change these facts. The system remained very capable in the tactical fleet of M60 tanks and M113 Armored Personnel Carriers (APC), but was less than ideal for the next generation of vehicles.

Besides materiel deficiencies this modern antiarmor organization suffered from the same key problem of poorly developed and communicated doctrine as its WWII ancestors. Farsighted professional articles on the subjects of tactics and doctrine for TOW based organizations were available throughout the 1970s.[69] Yet in 1982 battalion commanders were recognizing that the available doctrine did not reflect the capabilities of the TOW weapon or the antiarmor company. Manuals still advocated decentralized employment of the antiarmor platoons in the defense, offered no offensive role, and amounted to little more than a name change from 106mm recoilless rifle doctrine.[70]

It is not surprising that the organizational design still reflects this outmoded decentralized employment

doctrine. The TOE does not authorize a combat vehicle for the company executive officer. Nor is a fire support team, recovery vehicle or ambulance support from battalion authorized.[71] Yet the organizational design authorizes these supports to each rifle and tank company, ignoring the antiarmor company's greater density of combat vehicles (12 ITVs and 4 APCs to the rifle companies' 14 APCs).

The ITV-equipped antiarmor company was materially, organizationally and, to a lesser extent, doctrinally adequate for the active defense combined arms team. The company provided suitable long range antiarmor firepower, sufficient protection effect, and limited maneuverability, which helped to generate a level of task force combat power commensurate with the active defense battlefield. It is clear key figures of the day viewed the company as an integral member of the combined arms team. These included the designers of the new heavy division and key TRADOC Commanders.[72]

However as the Army approached the mid-1980s, Echo company was ill prepared to function under the offensive, maneuver oriented tactical concept envisioned for the multi-role combat vehicles. Not surprisingly, the antiarmor organization's ability to contribute to task force combat power generation declined as its ability in each dynamic decreased relative to the rest of the task force. In addition the opportunity to correct deficient organizational designs became minuscule due to resource constraints imposed by the 1984 Army of Excellence initiatives.[73]

AIRLAND BATTLE THROUGH TODAY-

In the second half the 1980s objections to Echo company's utility and effectiveness began to arise. Simultaneously some units were learning to use the company effectively despite the lack of doctrine, poor

organizational design and inferior materiel. These divergent trends would come together with the use of antiarmor in the Gulf War, and the organizational scrutiny the company underwent in the aftermath.

By 1985 mechanized infantry battalions (particularly M113 APC-equipped) were enjoying greater success employing Echo company. Decentralized employment of the antiarmor assets was on the wane. Echo company was even considered appropriate for use as an additional company team or "fifth player."[74] Favorable National Training Center (NTC) results were possible with imaginative use of Echo company.[75] But as the Army increased the fielding of the BFV the unsolved problems of Echo company's doctrinal role, and the organizational and materiel deficiencies sparked fresh criticisms. This led the Infantry School to reassert the need for the organization in a series of correspondences to the Army.

Typical criticisms were those of the Commander, III Corps where the BFVs were first fielded in the continental United States (CONUS). Among the III Corps commander's objections were the ITV's incompatibility with the BFV battalion, its slow rate of fire, and the belief that if it was to be retained Echo company should be organic to the tank battalion.[76] The Infantry School's position stressed the continuing need for the antiarmor company as a force to "fix in depth" and, through "excellent overwatch," to free up tanks and BFVs to maneuver. On Echo company as an organic asset to tank battalions, the position inconsistently warned the ITVs, "will only slow the tanks down."[77] Interestingly the Infantry School emphasized a definitive role for Echo company in the offense that was largely absent from existing doctrine.

By the end of the 1980s the units rotating through the NTC (increasingly BFV equipped forces) were

observed having difficulty using Echo company in the offense.[78] At the Army's request the Arroyo Center of the RAND corporation conducted a study of the situation concentrating, "on the use of TOW weapon systems in the offense."[79] Their findings were true revelations. Simply put, the great uncertainty over the role of Echo company in the offense stems from incomplete, vague, unclear doctrine.[80]

Specifically the study's doctrinal review found the antiarmor manual (FM 7-91 dated July 1987) does not even discuss the antiarmor company in offensive operations.[81] They also reviewed the critical battalion task force level manual (FM 71-2 dated September 1988) which guides the commander and staff in their integration of Echo company into the combined arms fight. They found it to be overly broad in discussion of offensive employment of the antiarmor company.[82] The study's conclusions also gave emphasis to the materiel problem, citing the ITV's defensive nature and lack of agility in performance of synchronized Airland Battle operations. The report recommended giving consideration to replacing the ITV with the M3 Cavalry Fighting Vehicle (CFV).[83]

As the RAND study was being published the Gulf War burst upon the scene. Though the final reports remain unavailable, it would appear evaluations of Echo company's performance remain mixed. Yet it is clear the TOW missile remained effective in this conflict.[84] But broad conclusions will be difficult because the Army had two different organizations in DESERT STORM. VII Corps mechanized infantry battalions left their ECHO companies in Europe, reflecting the belief that the organization lacked utility in the offense.[85] The Center for Army Lessons Learned (CALL) found some Gulf War commanders felt the antiarmor company performed critical functions in the

offense. Yet the same commanders had sharp criticism of active defense era materiel and organization.[86] It seems clear that some units could both see the problems and envision Echo company as a valuable combined arms player, if given proper materiel. The Army leadership noticed the situation.

During the Gulf War, in January 1991, the Chief of Staff of the Army (CSA), General Carl Vuono, sent his staff concerns about the structure of Bradley infantry battalion Echo companies.[87] This sparked an 18 month series of TRADOC internal studies, reviews, and briefings to the Army on the issue of the need for the antiarmor company. Throughout the studies the Infantry school restated the case for Echo company, primarily arguing that it provided a vital fixing force capability and thus freed tanks and BFVs with infantry to conduct decisive maneuver.[88] In short these were a reiteration of the 1986 arguments. A possible key factor in these discussions may have been the Army's budget driven modernization decision to delay the production decision on LOSAT from 1994 to 1997.[89]

Only recently has the entire issue come to closure. It now appears the Army has decided to keep Echo company in the BFV-equipped mechanized infantry battalion. In the near future the Army will remove twelve ITVs and three APCs from Echo companies and replace them with fourteen M3 CFVs drawn from existing vehicle stocks.[90] Recently the Infantry School drafted a White Paper on the tactical employment of the M3-equipped Echo company emphasizing firepower and fixing capabilities.[91] The paper captures the best of the evolution of thought on employing the ITV-equipped Echo company as outlined in Captain Edward Gibbons' Infantry magazine article, "Echo Company in a Heavy Task Force".[92] With a few exceptions the paper falls into the antiarmor doctrinal trap of merely being

moderately evolutionary and does not emphasize strongly enough the new and increased possibilities for employing a M3-equipped Echo company.

The pace demanded by the offensively oriented Airland Battle tactical concept, inevitably uncovered the weaknesses of an organization designed for the active defense. In relation to likely battlefield requirements, the materiel and organization of the ITV-equipped Echo company must be considered marginal at best. Critically, the continuing saga of deficient how-to-fight doctrine, covering offensive employment of the antiarmor company, did not help the organization. The ultimate test has always been the ability of task force leadership to consistently get unity of effort between key assets. The inability of that leadership to integrate the antiarmor company into the combined arms fight consistently, led to a rift in the force. The simultaneous, side-by-side use of two different mechanized infantry battalion structures during the Gulf War symbolizes the depth of that rift. A change was clearly in order. Now the issue is whether the upgrade to a M3-equipped antiarmor company is the right solution. Before pursuing this in detail it is useful to review how other armies view antiarmor warfare, combined arms and the need for antiarmor organizations.

IV. ANTIARMOR UNITS IN OTHER ARMIES

This lengthy review of the US Army's chosen path in the evolution of antiarmor doctrine, organization and materiel requires some balance. A brief comparison and contrast of some other approaches, specifically a look at the antiarmor developments of the British, German and Russian armies from WWII through today, provides that balance. Each of these armies had a unique and

influential impact on the US Army's approach to antiarmor questions, which will be highlighted.

BRITISH ARMY ANTIARMOR-

The British Army's conceptions of mechanized warfare are based on the longest experiences of any Army. The work of J.F.C. Fuller bolsters these efforts to this day.[93] Fuller urged, "plasticity of mind," and warned all reading his works against, "adherence to dogma." [94] Yet it is possible the British defeats of 1940 in Europe and 1941 in North Africa, stem from dogmatic adherence to a misread of Fuller's 1932 notions of "a tank force for offensive power and an anti-tank force for protective power...(to) establish a modern 'wagon laager'."[95] The lack of combined arms unity of effort in the organization of British armor forces, in particular pure tank brigades with all other arms lumped into a nebulous support group, haunted the British for the first three years of the war.[96] The slow recognition of the path to successful combined arms can be attributed to a number of things. Among them are the contemporary confusion about the nature of German successes in 1940, the fractured nature of the British army in 1940-41 and the presence of divergent philosophies, such as searches for Liddell Hart's indirect approach.[97]

This extended into their antitank effort, where divisional antitank regiments were left entirely behind at times.[98] British infantry units had even more difficulty. They had to reform their antitank platoons while in combat in North Africa.[99] It was from their observations of the enemy that the British slowly turned away from the tank-vs-tank engagement and began to treat antitank guns as the best means to defeat tanks.[100] Therefore it is not surprising that initial US efforts did not take many early war antitank

lessons from the less than successful British. Perhaps this also explains why the US and British differed in their pursuit of "tank surrogates."[101] The British avoided them and kept chiefly to versions of light and heavy tanks, while the US, along with the Germans and Soviets pursued these various forms of lesser tanks.

In many important ways though the British and American perceptions of antitank combat were to be conclusively linked. Throughout the war the British and Americans were using the same, often inferior, equipment.[102] In particular both started the war with the towed 37mm and moved to the towed 57mm (or six pounder) as the primary infantry antitank weapon.[103] Also by war's end it is clear British and Americans were sharing antitank tactics and doctrine. Lieutenant Colonel Court's assignment as a top instructor at the US Army Tank Destroyer Center for the last years of the war is suggestive of this close linkage. The fact that his writings offer variations on antitank tactics of Germans, Soviet and Japanese origin, yet makes no such distinction between US and British tactics, suggests how close that relationship had become.[104] Organizationally, Court politely underemphasized British and US differences for his own purposes, but the distinction between British and German "organic" divisional antitank and US "attached" was important.[105]

In the post-war era the British adopted the view that the best antitank weapon is another tank.[106] Clearly the US and British armies remained kindred spirits in this regard. Paralleling the US Army in the 1950s, the British fielded recoilless rifles for infantry units, while their Army League Study Group of 1955 pondered the need for an Army in the atomic era, and seriously considered Liddell Hart's assessments of the benefits of pentomic organizational design.[107]

Without the distraction of Vietnam the British Army remained focused on the threat to Europe throughout the next two decades. Having wrestled with the advantages of kinetic energy and guided missile antiarmor solutions (or both), they chose to go into first generation ATGMs in the 1960s.[108] The result was the long lasting Swingfire missile. Striker, an ITV-like ATGM vehicle, in service with the British and Belgian armies in the 1977 timeframe, featured Swingfire.[109] It is probable that Swingfire and Striker provided a model for the US to study while working on TOW and the ITV, respectively.

There has been much in the British Army's world outlook that correlates with our own. Of particular note is their requirement for force projection for NATO missions and for recent conflicts in the Falklands and DESERT STORM.[110] Their reliance on multi-role tanks and some ATGM antiarmor continues to parallel our efforts and today's force projection concerns.[111] Germany and Russia broadly represent a different antiarmor approach. Their world outlooks have been of interest for the last half century as well.

GERMAN ARMY ANTIARMOR-

It is interesting that the Germans began WWII with the same, largely ineffective antitank armament as the British and the Americans, the 37mm gun.[112] They even received an early dose of their own "panzer fever" medicine when Erwin Rommel's division was nearly overrun by counterattacking British tanks at Arras in May 1940.[113] In spite of immediate measures taken to upgrade divisional antitank to 50mm and eventually to the dreaded 88mm, German regimental infantry were stuck with the 37mm and a replacement 50mm gun long after these were inadequate, much like their British and American counterparts.[114]

These similarities aside, the Germans generally maintained a qualitative edge over Anglo-American tank and antitank materiel in North Africa and throughout the campaign in Europe.[115] On the Eastern front they were not so fortunate. Even in the successful summer days of 1941 General Heinz Guderian felt alarm at the high quality of Soviet armor in the T34 and KV1 tanks.[116] Among the German countermeasures were their famous Jagdpanzer tank destroyers and assault guns. These vehicles featured a simple and inexpensive turretless design that offered superior firepower and protection to contemporary Soviet and Anglo-American tanks, along with adequate mobility.[117] Despite excellent tank design the Germans continually fell short of the Soviet quantity and quality of tank and anti-tank materiel production.[118] It is important to note that the German decision to focus on upgrading tank forces and aircraft materiel, to the detriment of other arms, finally caused their combined arms team to falter.[119]

German combined arms doctrine was ascendant through much of the war and this was particularly true for antiarmor warfare.[120] Combined arms warfare, as practiced by German forces, clearly dominated in France in 1940, North Africa and the first two years of the Russo-German front.[121] German antiarmor doctrine emphasized aggressive and skillful use of antitank guns as the primary killers of tanks which set conditions for combined arms maneuver.[122] Much of the tactics instruction from the German Wunsdorf Antitank School was in use by the Allies by the war's end.[123] For the broad category of antitank doctrine it can be stated that the pace setters were the Germans, followed by the Soviets who defeated them with their own doctrine at Kursk, by the British who also learned from the Germans and then the Americans.[124]

In the area of organization it is said that:

> The outstanding characteristic of German armored doctrine was the close integration of tanks, antitank guns, infantry, artillery and aircraft into a combined arms team.[125]

In short an outstanding organization, a "self sufficient formation of all arms."[126] In North Africa the Germans had interdependence of arms at battalion level where they possessed their own light howitzers, machine guns, mortars and antitank guns.[127] Also the panzer division's organic battalion of heavy antitank guns had supplemental guns added, including 88mm.[128]

It is not any wonder that as the Bundeswehr came into its own in the 1950's and 1960's, it remembered these antiarmor lessons. The Germans did not stress production of recoilless rifles but did get involved with early ATGMs, fielding their Cobra missile in the 1960s.[129] Until recently the Bundeswehr had a mixed philosophy of guns and missiles for its primary antiarmor weapons. The missile-equipped Tank Destroyer 2 with the French SS11 missile and the 90mm Tank Destroyer were their mainstays throughout the 1960s and 70s.[130] In the early 1980s new missile equipped tank destroyers replaced them. Respectively, they were the Jaguar 1 armed with the HOT missile and Jaguar 2 armed with the TOW.[131]

Throughout this period several articles, including an analysis by the program manager of the highly respected Leopard 2 tank, expressed strong sentiment for an improved gun-equipped tank destroyer.[132] Basically the debate hinged on the twin issues of questionable ATGM performance against modern tanks on a shrinking battlefield and the cost effectiveness of single role tank destroyers versus expensive but multi-role tanks.

Organizationally the Bundeswehr will retain the organic Jaguar-equipped antiarmor company in each of

the 23 mechanized brigades that remain following post-Cold War reductions.[133] It is clear the modern German army continues to place an emphasis on antiarmor forces as integral members of their combined arms team.

RUSSIAN ARMY ANTIARMOR-

The Soviet or Russian Army from WWII to today is the next crucial element in this discussion. Since they are primarily a land power it is not wholly unexpected that their antitank philosophy has more in common with the Germans, than the Americans or British.

In Kenneth Macksey's excellent history of armor warfare entitled Tank versus Tank, he carefully outlines the tank/antitank materiel advantage that the Soviets began with in 1941. He then traces how the Germans temporarily gained an edge with the introduction of weapons like the Tiger and Jagdpanzer, but ultimately the Soviets recaptured the lead in late 1943 through 1945.[134] Perhaps more important though was the Red Army's use of quantity to bolster their tenuous qualitative edge:

> For the Russians it was different. They faced massive and skilful (sic) tank attacks; they responded by abandoning finesse and variety and concentrating on the volume of production of simple powerful guns. In the end it worked, and the Panzers were overwhelmed.[135]

Of particular note were the Soviet assault guns including the SU100 and SU122. In addition to an antitank role, this uniquely Soviet weapons idea provided accompanying fire support to attacking tanks or infantry.[136] On the broad category of antitank materiel in WWII, it can be stated that the Soviets led, followed by the Germans who periodically surpassed them, then by the American tank destroyer attempts and then the British, who emphasized the tank.[137]

The initial Red Army advantage in quality of materiel did little to offset their inappropriate

doctrine and an "almost complete absence of antitank defense."[138] The desperate situation, which included shortages of tanks, antitank, engineers and artillery, drove the Soviets to what has ultimately become their all arms solution to antiarmor warfare. This included a special emphasis on the whole of the artillery, to include antiaircraft artillery, serving as an antitank weapon.[139] Inherently combined arms, "this integration of all types of units and weapons," used, "the experiences gathered from numerous failures to create a thorough antitank defense at Kursk and thereafter."[140]

Nor did the all arms' doctrine neglect antiarmor forces. Between 1941 and Kursk in 1943, Soviet rifle formations, division through battalion, tripled their organic antitank organizations and weapons.[141] The Soviet defensive scheme at Kursk, "was based on the use of deeply echeloned antitank forces integrated into every level of command."[142] Equally the great Soviet counteroffensives established new doctrine and made definitive use of antiarmor forces to facilitate combined arms maneuver. Specifically antiarmor forces rapidly reinforced the exploitation forces, releasing tank formations for decisive maneuver. Antiarmor forces covered the flanks, protected assembly or provided accompanying fire support.[143]

WWII shaped the Soviet Army views of combined arms and antiarmor warfare. In the area of post-war antiarmor materiel the Soviets have been reluctant to wander far from the antitank gun. They did not show much enthusiasm for recoilless rifles and were intrusive in their initial efforts with ATGMs.[144] While the Soviets do acknowledge that the best tank killer is a tank, they are equally likely to stress the tank's primary role of offensive action.[145] Their view has been, and remains, that ATGMs have

weaknesses that must be balanced by mixing them with antitank guns.[146] As recently as 1989, the previously all ATGM motorized rifle regiment antitank unit added the MT-12 gun.[147]

This principle, along with the need for mobility and sheer mass of antiarmor firepower, guides the Soviet organization of antiarmor forces.[148] The Soviet philosophy of force structure has not relented in keeping organic antiarmor organizations at echelons from army to battalion. Exceptions are tank organizations from division through battalion and BMP equipped infantry battalions.[149] The Soviet view of the defense today is as it was in 1945, that it is, "first and foremost an anti-tank defense."[150]

Key to grasping the essence of Soviet antiarmor warfare and doctrine is to review the key post WWII work on the subject, Antitank Warfare by G. Biryukov and G. Melnikov, first published in 1972. The author's opening chapter places antiarmor warfare in the proper Soviet perspective:

> Modern all arms combat is unthinkable without provision for struggle against the enemy's armoured weapons. Second only to the combatting of nuclear weapons, antitank warfare has become the key element in any combat operation, a vital part of all-arms combat.[151]

The authors further specify that antitank weapons are divided into two categories: special and general.[152] This inclusive listing of every possible battlefield weapon under these categories, equates them directly to the all arms solutions of Kursk. These categories remain in Soviet doctrine today.[153]

There can be no doubt that the Russian Army faces a different set of circumstances than does the US or even the British Army. As a land power, and perhaps now only a regional power, it has a different focus. It is that focus and the Russian extensive land warfare experience we must respect. Clearly their view is that

antiarmor warfare is an inherent part of the modern mechanized battlefield. It is also apparent that antiarmor organizations are inherent members of their combined arms team. Is there something there for us?

To sum up, historically the British antiarmor organizations struggled in fulfilling their fundamental firepower and protective roles. Inferior materiel, but especially poor doctrine, impeded their early WWII performance. The Wehrmacht antiarmor organizations, working within an effective combined arms doctrine, not only provided firepower and protection, but a basis for decisive maneuver. Soviet antiarmor, so badly outnumbered initially, had to develop around an all arms approach which soundly based their antiarmor organizations in the combined arms team. As Russian antiarmor formations grew in number and quality, they met the basic firepower and protection functions. They reached the next level of providing the basis for decisive maneuver at Kursk and during the Red Army's subsequent exploitation and pursuit operations.

From this review of other armies' antiarmor experiences it is clear the US Army had alternative paths and influences to consider. The British Army of the WWII and the early Cold War eras had a major impact on early US antiarmor efforts. The German Armies, both old and new, have been inextricably linked with the US Army, as an enemy and as perhaps our closest ally in the decades immediately preceding the end of the Cold War. WWII German antitank doctrine is the case study of success for all armies. Finally the Red Army, and today's Russian army, embodies the other half of the great Eastern Front tank versus antitank battles of WWII. It has also represented the focus of all the previously mentioned armies' efforts for the last fifty years, all the while pursuing its own different, but comprehensive and deadly, form of antiarmor warfare.

The obvious foil to any such reviews of distant and recent history is the inevitable progress of technology. To assess the antiarmor issue properly requires a brief survey of technological trends.

V. EMERGING ANTIARMOR TECHNOLOGIES AND CONCEPTS

Review of the last sixty years of antiarmor history has also provided a look at the fundamental issue of how newly available technology is integrated into the combined arms team. Study of the continuing need for antiarmor organizations must assess ongoing and emerging trends in technology and their probable battlefield affects.

TRENDS-

Though the end of the Cold War has undoubtedly changed the intensity and perhaps the direction of emerging trends, the hunt for more effective permutations of combined arms has a unique drive all its own. Antiarmor trends and developments both drive and are driven by these trends.

Broad Combined Arms. The mechanization of all aspects of the battlefield, incompletely begun under J.F.C. Fuller in 1918, continues today in spite of the expense.[154] Not pursuing this trend represents a potential Achilles heel to today's smaller but increasingly sophisticated combined arms teams.[155]

The multi-role combat vehicle trend will continue. It began with German and Soviet main battle tanks during WWII and shifted to the British and Americans during the Cold War period.[156] This is now so prevalent that the renowned British mechanized battlefield expert and author, Brigadier (Ret.) Richard Simpkin, has lamented that today's tanks have

emphasized their antitank role to the point they are little more than very expensive tank destroyers.[157] The arrival of the infantry fighting vehicle (IFV) is another example of this trend. Besides their mission to move infantry, they have largely filled the infantry support gun role. Some IFVs have significant antitank capability.[158] Adding antitank capability to air defense systems is another example of this trend.[159]

The growth of the speed, firepower and protective effect of attack helicopter organizations has nearly fulfilled the doctrinal dream of US WWII tank destroyers. The attack helicopter's ability to move rapidly about the battlefield and provide a variety of destructive firepower, encourages our proactive use of them in the deep battle. This is consistent with the envisioned offensive role of tank destroyers.[160]

Antiarmor Specific. The race for an advantage between armor and antiarmor technologies has pitted main battle tanks against a variety of gun (kinetic energy) and guided missile (chemical energy) solutions over the last half century. Increasingly rapid technological breakthroughs insure neither side, or solution, has the upper hand for long. As a recent RAND study stated, "both sides continually introduce new technology and briefly hold some advantage in firepower, protection, mobility or automation."[161]

In the 1970s many felt the missile had gained supremacy.[162] By the mid 1980s Richard Simpkin and others assessed that the combination of composite armor on faster tanks had driven ATGMs from the middle ground of direct fire engagements. Due to this assessment many Europeans consider tank destroyers based on kinetic energy guns the best future solution to main battle tanks.[163] Monographs by Majors David Huntoon and James Cope developed thoughtful arguments calling

for a similar US solution. Based on US NATO missions, both authors discussed the lack of a comprehensive US antiarmor effort, citing the ITV-equipped Echo company as a specific weakness. Each advocated fielding tank destroyer organizations, though they differed on force structuring and missions.[164] In the context of the Cold War these arguments were viable. However, viewed with today's emphasis on force projection, endorsement of an antiarmor solution with the same strategic mobility problems as tanks is not helpful.

In the 1990s the issue seems to have taken another turn. Some see dominant tanks or tank destroyers based around such new technologies such as liquid propellant ammunition or electro-magnetic gun design. These could be in use shortly after the turn of the century.[165] Yet the initial ATGM responses to the problems of the 1980s, which included precursor charges and top attack profiles by TOW and HELLFIRE missiles, did very well during DESERT STORM.[166] Though it remains hotly debated, at least one expert acknowledges that composite and reactive armors will not be able to defeat all types and sizes of missile attacks.[167]

It is likely western armies will be increasingly selective of upgrades and new technologies for armor and antiarmor weapons.[168] The brief advantages of the Cold War arms races are no longer affordable. The US philosophy of seeking, "dramatic enhancements" in capabilities, will be more strongly sought than ever.[169] The LOSAT and NLOS-CA programs are such capabilities. NLOS-CA's fiber optic technology may allow brigade commanders to engage beyond the horizon 10 or more kilometers and fly individual missiles directly on to priority individual targets. The kinetic energy or hypervelocity missile in LOSAT, with ranges approaching five kilometers and muzzle velocities on par with a tank round (5000ft/sec versus

M1A1 120mm 5450 ft/sec), may very well end the gun-missile race.[170] The Armor School is even looking at it for use on main battle tanks.[171] Further the Advance Kinetic Energy Missile program (ADKEM), and similar European efforts, will apply this technology to the dual roles of antitank and air defense.[172]

IMPLICATIONS-

For Combined Arms. Colonel George M. Hall has posited the existence of an inevitable cycle of military technology. In this cycle relatively inexpensive and effective countermeasures drive dominant technologies from the battlefield. He stresses that advancements similar to the hypervelocity missile may have that effect on the tank and helicopter in the future.[173] Still, Richard Simpkin, among others, has reminded us that the tank has been declared dead on at least seven different occasions this century and remained dominant in each case.[174] A host of experts are wisely averse to predicting any near-term demise for the tank. They foresee further adaptations to meet all challenges effectively.[175] Yet the US must have this both ways. We must retain a balanced posture in research, in development and selective fielding of both sides of the armor-antiarmor equation. It remains the central issue of combined arms on the mechanized battlefield.

For Antiarmor. A primary fallout of these trends is that the pure or specialized antiarmor role has narrowed considerably. In assessing any future return of the US tank destroyer capability Dr. Gabel realized this trend stating as,

> weapons grow in sophistication and cost, it is increasingly unlikely that any army could afford to field large specialized antitank elements that can perform no other functions in battle.[176]

In short this means that US antiarmor weapons, and more

importantly organizations, must serve more than a single battlefield role or function.

Assessment of the M3 CFV antiarmor weapon platform shows that, consistent with Gulf War results, it is a fully capable antiarmor platform now and for the near future. The M3's ability to fire TOW2A precursor charge missiles and TOW2B top-attack missiles, gives it a robust capability for successful engagement of the vast majority of composite or reactive armored vehicles.[177] The M3 is also an excellent candidate for the upgrades like the TOW Sight Improvement Program (TSIP), if it regains funding. The upgraded sight would allow greatly enhanced target acquisition, target lock-on, and simultaneous engagement of targets.[178]

VI. COMPARISON AND ANALYSIS

The previous review of future concepts and technology completes the assessment of twentieth century mechanized combined arms warfare by US and other important armies. The issue of antiarmor units as a requirement for combined arms warfare remains.

Unlike the Russian army, we lack an institutionally defined common understanding of the essence of antiarmor warfare and the convergent roles various branches and types of arms have in it. Therefore it is important to keep the area of discussion tightly framed. Throughout this monograph the area of concern has been divisional antiarmor warfare requirements on a mechanized battlefield. This distinguishes the topic from the need for antiarmor forces in non-mounted infantry formations, where antiarmor units still serve their classic protective function. In the US Army it is also possible to discount the division level. The understood, but largely unacknowledged, "antiarmor" role of attack helicopter units is predominantly a

divisional capability. As stated earlier attack helicopter unit's provide a general force protection capability roughly equivalent to that sought under the WWII US tank destroyer force concept. As such the units are division commander assets, which are, at least for the immediate future, not habitually available to the heavy force close fight. Additionally by the criteria established earlier, attack helicopter units do not meet the definition of antiarmor organizations this monograph is putting under scrutiny. What remains then, as areas for focused analysis, are the brigade and battalion task force.

ON COMBINED ARMS-

The essence of what antiarmor organizations bring to the combined arms battle is their contribution to the higher unit's dynamics of combat power; explicitly to the dynamics of firepower, protection and maneuver.
FIREPOWER: Fundamentally an antiarmor unit possesses and efficiently provides credible antiarmor firepower to the higher force. Historically this is firepower that is somewhat, but not exclusively, unique in the ability to defeat the enemy's dominant armored vehicle. For this century that vehicle is the main battle tank. The quality of the defeat of the enemy tank determines the credibility of that firepower. Functionally the antiarmor unit should defeat the enemy tank in an equal or more effective manner than the remainder of the force. A good example of credible and efficient firepower was the Afrika Korp's devastating use of primarily 50mm antitank guns against the US 1st Armor Division in February 1943. This occurred long after equally or better armed Panzer tanks had arrived the previous summer.[179]
PROTECTION: Traditionally protection is the primary effect antiarmor organizations provide their higher

unit. Whatever the predominant branch of arms of the higher unit, it expects a degree of protection against tanks from subordinate antiarmor units. J.F.C. Fuller, among others, emphasized this.[180] Our modern use of multi-role combat vehicles, such as antitank capable tanks and infantry fighting vehicles, has currently lowered our mechanized force's need for protection from tanks. So the force's requirement for antitank protection may be less. But if parallel developments have occurred on the enemy side, the volume and quality of enemy armor vehicle targets has also increased. The nature of targets to be protected against may have changed, but the total requirement for protection of the force remains the same or increases. A corollary is that the antiarmor organization must be able to adequately maneuver to deliver the credible firepower to do the protective function properly.

MANEUVER: Traditionally maneuverability is a supplementary capability of antiarmor units.[181] However, the central issue is not the antiarmor organization's ability to maneuver, but the contribution it provides to the higher unit's combat power dynamic of maneuver. The antiarmor organization can set the conditions for the higher unit's successful maneuver by applying its firepower, protective effect and internal maneuver against the enemy in a timely manner. Achievement of this has been rare. Properly synchronizing antiarmor activities and combined arms maneuver is a higher skill only some armies could master. The Germans did it routinely in North Africa. The Soviets found it in their exploitation and pursuits of WWII and continue to orient on the same tasks in their modern doctrine.[182]

In sum then there is a historical and theoretical basis for the continuation of antiarmor organizations in combined arms, but does it apply to Echo company?

ON ECHO COMPANY-

As alluded to in the corollary, for the antiarmor organization to contribute to a particular dynamic of combat power, it must have a minimum level of sufficiency of its own dynamics. That level should normally be defined relative to that of the supported unit. For instance if a 106mm Recoilless platoon in jeeps provides offensive antiarmor fire support to an infantry company in APCs, the platoon must have the internal ability to maneuver and protect itself. If the platoon cannot travel over broken terrain or through falling mortar fire in a manner somewhat equivalent to the APCs, then the contribution to the company's firepower dynamic will be severely degraded. The 106mm platoon may find a way to offer limited support, but unity of effort is unduly difficult.

Similarly the ITV-equipped Echo company critically lacks an adequate capability for self-defense on the move. Also it lacks infantry. Therefore it does not enhance the maneuver dynamic of the modernized task force. It is important to realize that the key item is not slower cross country speed or the lesser armor protection of the ITV.[183] The Infantry school has correctly advocated that these can be compensated for with careful planning and clear procedures.[184] What planning usually cannot avoid is the recurring necessity to reinforce Echo company ITVs with a quick fire system (BFVs or tanks) to ensure and enable the unit's reliable movement on offensive missions.[185] In the offense there is a frequent need for Echo company to maneuver in the vicinity of enemy security forces, potentially BMPs and tanks. This compels an unacceptable choice: gamble with Echo company lives or siphon quick firing combat power from the main effort and detract from the task force's firepower or maneuver dynamic. The lack of recognition and emphasis of this

point in recent writings avoids the heart of the materiel deficiency and the associated battlefield consequences.[186]

On this principal difference alone, the M3-equipped Echo company is an immediate and definitive improvement to the overall task force maneuver dynamic. In turn the task force's ability to generate combat power and to conduct combined arms warfare will be significantly increased. Potentially this is the modern equivalent of what the Germans learned in North Africa. The M3-equipped company provides higher commanders an organic economy of force organization.

A requirement often overlooked is the need for effective management of the battle away from the designated main effort.[187] Echo company can become the habitual agent for this implied task. This can better focus the overall application of decisive combat power (tanks and BFV carried and supported infantry) by maintaining the mass, momentum and initiative called for in Airland Battle.

For the relatively inexpensive attachment of a fire support team, the unreinforced Echo company can now reasonably be assigned missions of attack-by-fire or support-by-fire from a separate or the main axis, screen the force's flank, advance or rear, or defend (battle position or sector).[188] Finally the task force or brigade commander should not shrink from better focusing the application of non-maneuver combat and combat support forces through the "economy of force" company. Attachment or OPCON of critical air defense, engineer, smoke assets to the antiarmor company should be routine.

The issue nearly becomes whether the Army should resource an organization whose primary effect is no longer protective but economy of force. Examination of organizational design of this sort of unit is proper.

ON ORGANIZATIONAL DESIGN-

FORCE DESIGN: The fundamental basis for the unit remains unchanged: providing credible antiarmor firepower. The M3 duplicates the ITV in this area. Like the ITV the M3 has a dual TOW launcher and a twelve missile on board load capacity. Also the Echo company M3s will retain ground mounted TOW systems for use in MOUT or airmobile assault operations.[189] The M3 improves upon the ITV in other capabilities. In particular it provides the 25mm cannon and 7.62mm COAX machinegun for self defense or to serve in the role of an infantry support gun. The M3 conversion plan further addresses the old organization's command and control problem by placing the platoon leadership, commander and executive officer in Cavalry Fighting Vehicles and providing the 1SG an M113. This insures leaders see the thermal battlefield as their subordinates do, while streamlining second-in-command and company logistical capabilities.[190] The sum of this is that the unit design is no longer defensive in nature. The residual design problems are significant, but external to the company's TOE. Echo company remains without necessary company team level support in the areas of fire support, vehicle recovery and combat ambulance.

FORCE STRUCTURE: Unlike other armies, the US Army did not structure an organic antiarmor organization into WWII divisions. Accordingly that antiarmor force structure lacked unity of effort when called upon to perform in the Ardennes in 1944-45.[191] Today the current and future presence of divisional attack helicopter organizations seems to obviate the need for antiarmor assets at that level. Yet as judged by the German and Soviet armies the inherent nature of antiarmor warfare in mechanized combined arms combat and the mix of technologies available in the near

term, indicate the need for at least an organic brigade/regimental level antiarmor organization to insure that unity of effort.[192]

Some pertinent US facts are that a 1979 force structure decision against a fixed brigade concept kept the brigade a tactical level, while seeking combination of arms at battalion level.[193] Other key facts are that the ranges on near term antiarmor replacement technologies such as LOSAT and NLOS-CA, make them likely to be employed in the brigade or lower battle. Also the M3 is a prime candidate for any upgrade, to include the TOW Sight Improvement Program (TSIP). Finally the M3-equipped antiarmor company provides a substantial potential to be a tactical pivot of maneuver, greatly enhancing the tank and BFV infantry formations' ability to maneuver.[194]

Using the criteria of economy of force in its output context, the retention of an M3 equipped antiarmor company is logical. With virtually no change in personnel or other critical resources, the simple conversion of the combat vehicles of one company results in a synergistic increase in task force combat power generation; the output is maximized. The key issue then becomes: who's combat power, at what level, and in what type of unit?

The Gulf War uses of Echo company raises a key point - the antiarmor company is a brigade commander's weapon.[195] With the enhanced abilities of the M3-equipped company, Echo company can be a more effective brigade security effort or, with reinforcement, an economy of force. However, US Army philosophies about functions at the brigade level, as well as the personnel expenses associated with maintaining a separate company, suggest that the antiarmor company will continue to be structured at battalion level for administrative purposes.

It is important to recall that Division 86 studies were replete with citations of the enhanced capability an ATGM company gives the tank battalion. Echo company should habitually be considered for employment with a tank heavy main effort in the offense or the defense.[196] Accordingly designing Echo company into tank battalions should be seriously considered to foster those benefits.

Nonetheless, inefficiencies associated with that idea must be considered. The existing antiarmor military specialty base is infantry. Also with the transition to HMMWV-equipped battalion scout platoons, there is no longer an organic basis for Bradley maintenance in the armor battalion. Given the Army's unwillingness to deal with these personnel and maintenance headaches under the now defunct Combined Arms Maneuver Battalion (CAMB) concept, it seems unlikely this design would be approved. The most likely result then is the continued presence of Echo company in the mechanized infantry battalion design.

ON LEADERSHIP-

Leadership is the most important dynamic of combat power and the ultimate player in insuring unity of effort. The history of US antiarmor efforts to date is scarred by poorly conceived, poorly coordinated and misunderstood doctrine. Since 1941 branch parochialism has had a large role in these problems.[197] The senior leadership of the Army must recognize this ingrained institutional flaw. By moving ahead to the M3 CFV equipped antiarmor company, the leadership has recognized and decisively dealt with the materiel and, to some extent, the organizational flaws. In light of our antiarmor technologies on the horizon this is most opportune.

Yet the job is only half done. Just as improved antitank materiel reaching US forces in 1944 could not

overcome inadequate tank destroyer doctrine, the M3 will not maximize the output of the modernized task force without serious revisions of doctrine. We must fix the doctrine and infuse that standard in our junior leaders, without branch parochialisms. Antiarmor warfare is an inherent part of combined arms warfare. Infantry, armor, artillery, aviation, air defense, and engineers all have a key part to play within it. Antiarmor units within each branch must understand combined arms may mean having to efficiently work with, or for, each other.

VII. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS-

Historically antiarmor organizations have been important members of the combined arms team. Today, despite having many other antitank capable units, antiarmor organizations remain combined arms members of German and Russian mechanized brigades. Certainly combined arms mechanized warfare is possible without antiarmor organizations, but it is considerably less efficient. Such a combination of arms for US heavy forces would lack economy of force in the output sense. It would not maximize the generation of combat power.

The underlying logic that compels this stems from the theoretical recognition that good antiarmor organizations are key contributors to each physical dynamic of combat power: firepower, protection and maneuver. Therefore efficiently designed antiarmor organizations, supported by solid doctrine and ably led, can consistently provide the extraordinary opportunity for decisive maneuver. On that basis, antiarmor organizations should remain integral members of the US Army's combined arms team.

RECOMMENDATIONS-

Antiarmor organizations must be multi-functional in organizational design, materiel and doctrine. The days of a single function antiarmor organization are gone. LOSAT or NLOS-CA units cannot be allowed to become single function units.

How-to-fight doctrine should be updated immediately to insure the comprehensive integration of the M3-equipped antiarmor company. The White Paper as well as the brigade and battalion task force field manuals should be rewritten to focus on the enhanced economy of force capability the organization provides. Doctrine must reflect that Echo Company provides brigade and task force commanders new options to weight and shape the combined arms battle. Echo Company should be presented as an ideal cross attachment to a tank heavy main effort in the offense or the defense. Doctrine should firmly stress that employment of Echo Company is a brigade commander's decision. Training must reflect these new missions.

Finally TRADOC should make the inexpensive and essential force design changes outlined previously. Supporting Echo company at the same level as BFV and tank companies will insure the economy of force effort is functionally independent, rather than competing with main effort companies for support.

ENDNOTES

[1]Dr. Christopher R. Gabel, Seek, Strike and Destroy: U.S. Army Tank Destroyer Doctrine in World War II Leavenworth Paper no. 12. (Fort Leavenworth, KS: Combat Studies Institute, US Army Command and General Staff College, 1985), 67,68.

[2]MAJ Robert W. Doughty, The Evolution of US Army Tactical Doctrine, 1946-76 Leavenworth Paper no. 1. (Fort Leavenworth, KS: Combat Studies Institute, US Army Command and General Staff College, 1979), 4. (Cited hereafter as Doughty-Evolution)

[3]MAJ Paul H. Herbert, Deciding What Has to Be Done: General William E. Depuy and the 1976 Edition of FM 100-5, Operations Leavenworth Paper no. 16. (Fort Leavenworth, KS: Combat Studies Institute, US Army Command and General Staff College, July 1988), 33,34.

[4]John L. Romjue, "A History of Army 86, Vol 1: Division 86: The Development of the Heavy Division, September 1978 - October 1979," (Office of the Historian, Training and Doctrine Command - TRADOC, June 1982), 6,7,51. (Cited hereafter as Romjue-"Army 86")

[5]Martin Goldsmith, "TOW Missile System Utilization at the National Training Center," (Study prepared for Combined Arms Training Activity-CATA by Arroyo Center, RAND Corporation, October 1990), 1,2.

[6]LTC Geoffrey D.W. Court, Hard Pounding, the Tactics and Techniques of Antitank Warfare with Observations on its Past, Present and Future (Washington, D.C.: US Field Artillery Association, 1946), 20; LTC P. Crevecoeur, "Striker... Latest of the Tank Destroyers," International Defense Review, 10 (June 1977): 473; CPT Timothy R. O'Neill, "Tank Destroyer for the '70s," Armor, Vol LXXXII no. 3 (May-June 1973): 38. (Cited hereafter as O'Neill-"Tank Destroyer") Court cites WWII towed weapons as tank destroyers, while LTC Crevoceur and CPT O'Neill refer to 1970 era ATGM vehicles with same term.

[7]Richard E. Simpkin, Antitank: An Airmechanized Response to Armored Threats in the 90s (New York, NY: Brassey's, 1982), 200. (Cited hereafter as Simpkin-Antitank)

[8]LTG Sir Richard Swinburn, "Future Armoured Warfare: The Case for the Tank," The RUSI Journal, Vol 137 no. 3 (June 1992): 35-36; Mark Hewish, "US

Programs: An Embarrassment of Riches," International Defense Review, 24 no. 10 (October 1991): 1088-1092. Swinburn's philosophy is that whatever antiarmor platform is most efficient should be used. Hewish lays out the capabilities of both Copperhead and Hellfire.

[9]CPT Johnathan M. House, Toward Combined Arms Warfare: A Survey of 20th-Century Tactics, Doctrine and Organization Research Survey no. 2. (Fort Leavenworth, KS: Combat Studies Institute, US Army Command and General Staff College, 1984), 2.

[10]US Army, "FM 100-5, Operations," Preliminary Draft, (Ft. Monroe, VA: Headquarters Training and Doctrine Command, 21 August 1992), p. 2-5.

[11]Ibid p. 2-11,p. 2-12.

[12]MAJ Glenn M. Harned, "The Principles of Tactical Organization and their Impact on Force Design in the US Army," (Advanced Military Studies Program Monograph, US Army Command and General Staff College, 1985), 2.

[13]Ibid 27.

[14]Palmer, Robert R. (and Kent Roberts Greenfield and Bell I. Wiley), The Organization of Ground Combat Troops (United States Army in World War II series), (Washington, D.C.: Government Printing Office, 1947) 290,291 as quoted in Harned, 28. It is important to understand Harned's use of Palmer, so Harned's use of the quote is cited.

[15]Harned, 28,29.

[16]Gabel, 5.

[17]Ibid, 1,2.

[18]Ibid, 9.

[19]Ibid, 10, 14-17, 18.

[20]Court, 88; see also 3,4.

[21]Ibid, 6,7.

[22]John Weeks, Men Against Tanks, A History of Antiarmor Warfare (New York, NY: Mason/Charter, 1975), 104.

[23]Allied Forces G-3 Training Section, "Training Notes from Recent Fighting in Tunisia: Experiences, Observations, and Opinions Collected from Officers and Men of Front Line Units, March 18-30, 1943," as paraphrased in Gabel, 35. See also Virgil Ney, Evolution of the US Army Infantry Battalion: 1939-1968 (Ft. Belvior, Va: US Army Combat Developments Command - Combat Operations Research Group, October 1968), 15.

[24]A. Kibler, "Organization, Equipment, and Tactical Employment of Infantry Division," (Report 15 of the General Board, US Forces European Theater, 1946), 6. (Cited hereafter as Kibler-Report 15) See also House, 114.

[25]Gabel, 35.

[26]House, 113.

[27]Ibid, 114.

[28]J. Holley and S. Fries, "Organization, Equipment, and Tactical Employment of Separate Tank Battalions," (Study 50 of the General Board, US Forces European Theater, 1946), Appdx 1,2,3.

[29]Gabel, 68.

[30]Ney, 17,18, see especially comments on TOE p. 182.

[31]House, 113.

[32]Gabel, 68.

[33]1LT John C. Binkley, "A History of US Army Force Structuring," Military Review, 57 (February 1977): 72. (Cited hereafter as Blinkley, "A History")

[34]Gabel, 18.

[35]Ibid, 30.

[36]House, 107. House explains that division virtually required the attachment of a tank destroyer battalion. Gabel 35, and 60-61. Gabel explains how this process routinely led to even lower attachment such that tank destroyers were not able to act in accordance with their doctrine when the Germans massed armor again in the Ardennes in 1944. Court, 90-91, 107 and 108-109. Court politely argues that unity of effort is only really achieved when each division has

an organic tank destroyer/antitank battalion.

[37]Samuel Conley, A. Kibler, and Richard Stilwell, "Types of Divisions, Post War Army," (Report 17 of the General Board, US Forces European Theater, 1946), 14.

[38]MAJ James S. Gavitt, "Considerations for the Distribution of Antiarmor Weapons," (Master of Military Arts and Science Thesis, US Army Command and General Staff College, 1985), 57.

[39] Kibler-Report 15, 6. See also GEN Joseph W. Stilwell, "Report of War Department Equipment Board, 19 Jan 1946," (U.S. Army Command and General Staff College, 1946, CARL 12960), 12.

[40]Doughty, 5.

[41]Ibid, 11,12.

[42]Kenneth Macksey, Tank vs Tank: The Illustrated Story of Armoured Battlefield Conflict in the Twentieth Century (Topsfield, MA: Salem House Publishers, 1988), 156.

[43]Weeks, 147,148.

[44] CPT John C. Blinkley, "History of US Army Force Structuring 1939-1961 - In Support of Div 86 Study" Draft, (Combat Studies Institute, Command and General Staff College, August 1979): 18. (Cited hereafter as Blinkley-"1939-1961"); Seymour L. Goldberg and Theodore C. Mataxis, Nuclear Tactics, Weapons, and Firepower in the Pentomic Division, Battle Group, and Company (Harrisburg, PA: Military Service Publishing Co., 1958), 121. Blinkley addresses the ONTOS system and the Army's use of it, whereas Goldberg and Mataxis cite ONTOS use by the USMC.

[45]Blinkley-"1939-1961", 31,32.

[46]Ibid, 34 and Weeks, 165.

[47]Goldberg and Mataxis, 107.

[48]Doughty, 20-25.

[49]Ibid, 40.

[50]Weeks, 165.

[51]Richard M. Ogorkiewicz, "Anti-Tank Weapons - A

Reappraisal," Armor Vol LXXXII no. 3 (May-June 1973): 23-27; O'Neill-"Tank Destroyer", 38-43. O'Neill proposes a tracked TOW vehicle with an armor cover (his drawings anticipated the ITV design quite closely) as a basis for divisional tank destroyer battalion while Ogorkiewicz argues for antitank weapons organic to all maneuver battalions, especially tank battalions.

[52]House, 189.

[53]Doughty, 5.

[54]Blinkley-"1939-1961", 35.

[55]LTC John F. Rhoades, "Is the Tank the Best Defense Against a Tank?," Military Review, Vol 31 no. 5 (August 1951): 48; COL Hans von Uslar-Glichen, "AntiTank Warfare," Armor Vol LXXIV no. 6 (November-December 1965): 51,52; O'Neill-"Tank Destroyer", 38,40,43. These articles are representative of some of the armor community debate in the 1950s, 60s and 70s respectively.

[56]House, 145,146; Richard E. Simpkin, Red Armour (Oxford, UK: Brassey's, 1984), 150-152. (Cited hereafter as Simpkin-Red); CPT Timothy R. O'Neill, "Needed Now: An Antiarmor Doctrine," Armor, Vol LXXXXV no. 1 (January-February 1976): 19. (Cited hereafter as O'Neill-"Doctrine") MAJ L. D. Holder, "Tank, Supertank, or No Tank At All," Armor Vol LXXXV no. 1 (January-February 1976): 41,43, 44. House and Simpkin discuss the resurgence of all arms in the Red Army following Exercise Dnieper in 1967. Both Simpkin and O'Neill discuss changes brought about by the BMP. Holder covers the growing expenses of main battle tanks well.

[57]Doughty, 41.

[58]House, 179,180.

[59]Macksey, 173, 174.

[60]Holder, 42; William S. Lind, "Some Doctrinal Questions for the United States Army," Military Review, Vol LVIII no. 3 (March 1977): 60. Holder on tanks in general; Lind on Israeli style blitzkrieg.

[61]Herbert, 34.

[62]Ibid, 34,81,88.

[63]GEN William E. Depuy, "Division Restructuring

Study Outline," (Depuy's handwritten outline to the TRADOC DRS Study Group, Office of the Commanding General, US Army TRADOC, 17 June 1976), 2. Also discussed in Romjue-"Army 86", 6,7.

[64]US Army CACDA, "Division Restructuring Evaluation - Independent Report - Maneuver Battalion Phase, Vol I Executive Summary," (Ft. Leavenworth, KS: Force Structure and Design Directorate, Combined Arms Center Development Agency - CACDA, September 1978), 16; See also Romjue-"Army 86", 43. Other studies strongly indorsing the ATGM company in the tank battalion include:

-Ronald G. Magee and Henry L. Tarkowski, "Analysis of the Division Restructuring Study Phase I War Games Technical report TR1-77, Vol 1, Main Report and Appendices I-III," (Directorate of Combat Operations Analysis, US Army Combined Arms Combat Development Activity-CACDA, January 1977), v, vii, p. 1-18, p. 1-21.

-US Army TRADOC, "Division Restructuring Study, Phase 1 Report, Vol I Executive Summary," (Ft. Monroe, VA: Division Restructuring Study Group Hq TRADOC, March 1977), 14.

-US Army TRADOC, "Division Restructuring Study, Phase 1 Report, Vol III Test and Analysis," (Ft. Monroe, VA: Division Restructuring Study Group Hq TRADOC, March 1977), 68,71.

-US Army TCATA, "Test Report FT 382A: Division Restructuring of the Heavy Divison, Phase II Brigade Test, Final Report," (Ft. Hood, TX: Hq, TRADOC Combined Arms Test Activity-TCATA, May 1979), 1-5,1-9,1-11.

-US Army CACDA, "Division Restructuring Study Evaluation - Independent Evaluation Report - Brigade Phase, Vol I Executive Summary," (Ft. Leavenworth, KS: Force Design Directorate, Combined Arms Center Development Agency - CACDA, December 1979), 11.

-US Army CACDA, "Division Restructuring Study Evaluation - Independent Evaluation Report - Brigade Phase, Vol VI (Phase III Organization Development)," (Ft. Leavenworth, KS: Force Design Directorate, Combined Arms Center Development Agency - CACDA, December 1979), 1-6,2-17,2-31.

[65]MAJ Robert A. Doughty and MAJ L. D. Holder, "Antitank Doctrine," Infantry Vol 66 no. 2 (March-April 1976): 19. (Cited hereafter as Doughty and Holder, "Doctrine"); O'Neill-"Doctrine", 22.

[66]Romjue-"Army 86", 50,51.

[67]John L. Romjue, From Active Defense to Airland

Battle: the Development of Army Doctrine 1973-1982 (Ft. Monroe, Va: Historical Office, US Army TRADOC, June 1984), 21,30,42. (Cited hereafter as Romjue-Development); Lind, 54-65, but especially 59.

[68]Ibid, 67.

[69]O'Neill-"Doctrine", 21,22. Doughty and Holder-"Doctrine", 17,18. O'Neill provides excellent insight into the offensive use of antiarmor forces and anticipates many of the doctrinal problems the Infantry community would be left to stumble through at individual commander and unit level throughout the 1980s.

[70] LTC Richard E. Davis, "TOW Doctrinal Deficiencies," (Individual study project, US Army War College, 16 Apr 1982), 3,7,8.

[71]CPT George E. Knapp, "ECHO on the Battlefield," Infantry, Vol 75 no. 5 (September-October 1985): 33.

[72]COL John W. Foss, COL Donald S. Phil and LTC Thomas E. Fritzgerald, "The Heavy Division," Military Review Vol LVIII no. 3 (March 1977): 14,15; Depuy, 2; GEN Donn A. Starry, "Combined Arms", Armor, Vol LXXXXVII no. 5 (September-October 1978): 21-22, Perhaps it was the sentiment of this article on combined arms which motivated Starry, to go along with Depuy's recommendation to restore the ATGM company to the mechanized infantry battalion three months later-see Endnote #66.

[73]US Army CACDA, "Final Report - The AOE Heavy Division, Vol III," (Ft. Leavenworth, KS: Combined Arms Combat Development Agency-CACDA, 1984), 1, p. 1-4, p. 1-5, p. 3-4.

[74]Knapp, 30; CPT Glenn L. Burch and CPT Christopher B. Valentine, "Echo Company," Infantry, Vol 76 no. 5 (September-October 1986): 37-38; CPT Michael S. Hackney, "Echo Company: The Fifth Player," Infantry Vol 75 no. 4 (July-August 1985): 20-24. These articles represent some of the internal infantry community learning occurring in some units during the mid 1980s. However, in the main they were not matched by doctrine, organization or material changes by the Infantry School.

[75]Goldsmith 1,2.

[76] Letter from LTG Crosbie E. Saint, Commander

III Corps and Ft. Hood, Texas, to MG Edwin H. Burba, Commandant US Army Infantry School, 30 December 1986.

[77] Letter from MG Edwin H. Burba, Commandant US Army Infantry School, to LTG General Crosbie E. Saint, Commander III Corps and Ft. Hood, Texas, 18 August 1986. The Infantry School position is laid out in greater detail in Message US Army Infantry School, ATSH-B (Commandant), "Echo Company," (DTG 051730Z May 1986), 1-10.

[78] Goldsmith, 2.

[79] Ibid, v.

[80] Ibid, 15,20.

[81] Ibid, 19.

[82] Ibid, 16,17.

[83] Ibid, 20-22.

[84] Hewish, 1091. The author mentions TOW's excellent Gulf War results with US Army and USMC units from a variety of platforms.

[85] Richard K. Fickett, "Letter to Infantry Magazine: Solving the ITV Problem," Infantry, Vol 82 no. 3 (May-June 1992): 3.

[86] US Army CALL, "DESERT SHIELD/STORM Observations: #DSSN 13 0927 Echo Company as a Brigade asset, dtd 17 March 1991; #DSSN 13 0962 Combined Arms Maneuver Battalion (CAMB) Issues, undated," (Saudi Arabia and Ft Hood Trip Report: Center for Army Lessons Learned-CALL; CARL files). #DSSN 13 0927 - Battalion Commander cites his Echo Company's use as Brigade security element. #DSSN 13 0962 - CALL post war survey of CAMB unit (same battalion) confirms Echo's use as brigade security and economy of force element.
US Army CALL, "DESERT SHIELD/STORM Observations #DSSN 12 0868 M901 ITV, 17 March 1991; #214, #215 Improved TOW Vehicle & #228, #265 Antiarmor Company, 19 March 1991," (Saudi Arabia: Center for Army Lessons Learned-CALL, CARL files). #DSSN 12 0868 - Brigade commander (same unit as #DSSN 13 0927, #DSSN 13 0962) rates M901 ITV as inappropriate match for M1 tank/M2 BFV formations. #214, 215 the Echo Company commander (same unit referenced in all previous observations) cites numerous maintenance problems and calls for ITV to be replaced by M3s or M1A1. #228 the Echo company

commander discusses brigade flank screen mission, cites key organizational shortfalls - lack of fire support team, no recovery capability and no ambulance evacuation support. #265 the Echo company commander discusses brigade flank screen mission, cites absolute need for ITV replacement system to be able to shoot on the move.

[87]Memorandum from Chief of Staff of the Army (GEN Carl Vuono) to LTG Reimer (Deputy Chief of Staff for Operations), "The Bradley Battalion Structure," (31 January 1991), 2.

[88]Memorandum from US Army Infantry School Assistant Commandant (BG Carl F. Ernst) to Commander US Army Combined Arms Command, "Echo Company," (undated), 3,4. (Item is signed, a copy faxed to CAC FDD 2 October 1991)

[89]Eric Ludvigsen, "Army Modernization Skips a Generation," Army, 42 no. 4 (April 1992): 19,20.

[90]Message Headquarters Department of the Army, DAMO-FDD (Deputy Chief of Staff for Operations, Force Design Division), "Documentation of BFVs in Bradley Echo Company," (DTG 071313Z July 1992), 1.

[91]US Army Infantry School, "White Paper: Bradley Equipped Echo Company," (Ft. Benning,Ga: Infantry School, undated), 1.

[92]CPT Edward G. Gibbons, "Echo Company in a Heavy Task Force," Infantry, Vol 82 no. 1 (January-February 1992): 28-32. Cpt Gibbons' article reflects the fullest development of the employment possibilities and techniques for an ITV-equipped Echo company. There are numerous similarities between CPT Gibbons' article and the White Paper, including the diagrams which are identical. The issue becomes whether the White Paper is excessively reflective of ITV capabilities and not adequately stressing the M3's possibilities.

[93]Swinburn, 35; J.F. C. Fuller, Armored Warfare (Harrisburg, PA: Military Service Publishing Co, 1943; Reprinted Westport, Conn: Greenwood Press, 1983),46, 115,116. Swinburn's opening section "Are tanks obsolescent?" frames his discussion of the roles of tanks, and antitank in particular, just as Fuller foresaw the roles in 1932.

[94]Fuller, xix.

[95]Ibid, 17,18. Fuller's 1932 text leaves the impression of a sequential activity - with the tank force "consisting of mobile machines, " followed by the second force of transportable antitank weapons. As Endnote #96 points out the British armor division structure that corresponded to this was quite unsuccessful. Fuller's 1943 addition on page 18 clarifies that he meant to indicate that he saw two echelons of antitank forces, the first of which was independently mobile and accompanied tanks.

[96]Shelford Bidwell and Dominick Graham, Fire Power: British Army Weapons and Theories of War 1904-1945 (Boston, MA: George Allen & Unwin, 1982), 215; See also House, 86,89,94,185.

[97]Macksey, 77 and House, 86. Each discusses contemporary confusion about the nature of German's success; House, 86,87. He discusses the fractured nature of British army; Bidwell, 233. He cites the influence of Liddell Hart in North African operations.

[98]Bidwell, 225.

[99]Ibid, 231.

[100]Ibid, 234; see also House, 88.

[101]House, 79.

[102]Macksey, 94,96; also House, 95,118.

[103]Gabel, 35,60 and Macksey 94; also Bidwell 231.

[104]Court, 115-126. These appendices provide an overview ofWWII antitank tactics of various armies.

[105]See Endnote #36.

[106]Weeks, 96.

[107]Weeks, 141-146. Discusses British recoilless rifle efforts; Army League, Great Britain, The Army in the Nuclear Age: Report of the Army League Subcommittee (London: Saint Clements Press, Ltd., 1955.), 1,40. Discusses whether there is a need for an army; ibid, 44,45. The benefits of pentomic design are discussed.

[108]Army League, Great Britain, The British Army in the Nuclear Age (London:Army League, 1959), 47,48.

[109]Weeks, 164-on Swingfire; Crevacour, 473,474-

on Striker.

[110]GEN Martin Farndale, "UK Land Forces Role and Structure into the 21st Century," The RUSI Journal, 136 no. 2 (Summer 1991): 7-10; GEN Peter Inge, "The Land Battle," The RUSI Journal, Vol 137 no. 3 (June 1992): 33; and Swinburn, 35,37.

[111]Swinburn, 37. He relates his views on force projection of tanks; British Army, "Staff Officers Handbook," D/DAT/13/38/ 54, 1988. The Handbook shows that vehicle mounted ATGMs in platoon size organizations are in mechanized infantry battalions and the divisional armored recce squadron; Farndale, 7-9. Farndale projects a future force reliant on MBTs and attack helicopters for primary antiarmor role, with hypervelocity missiles in an air defense role, though also presumably antitank capable.

[112]Macksey, 77.

[113]LTC John A. English, "A Historical Perspective on Antiarmor," Marine Corps Gazette, Vol 69 no. 12 (December 1985): 32; see also House 85 and Macksey, 78.

[114]US Army European Command, "Infantry Organization and Equipment Based on German Experiences in Russia," (Historical Division, European Command, July 1951), 20; see also Macksey, 78 and Bidwell, 230.

[115]Macksey, 94-96, 132.

[116]Ibid, 86.

[117]Werner Krapke, "A Design Concept for a Heavy Tank Destroyer," International Defense Review, Vol 16 no. 3 (March 1983): 341. This article is by the former program manager of the Leopard 2 tank. See also Uslar-Gliechen, 52 and House, 115.

[118]Macksey, 128,143.

[119]House, 185.

[120]Ibid, 184.

[121]House, 86 - France 1940; Bidwell, 235 - North Africa; Court, 122 and House, 97-99 - first two years of Russo-German fighting.

[122]Bidwell, 229; see also Court, 89 and English, 32.

[123]Court, 115-118. This appendix sketches out the German antitank instruction covered at the Wunsdorf Antitank school; English, 31,32,34. The German antitank unit PAK of 10 to 12 guns is adopted by the Soviets and used against the Germans at Kursk; Bidwell, 234 and Macksey, 132. Both authors stress that eventually the British began to adopt the German tactic of primarily killing tanks with antitank weapons rather than tanks; Court, 17. The discussion of US tank destroyer training at Camp Hood indicates the use of German tactics, in particular the notion that antitank units keep the enemy tanks off the infantry and in turn the infantry keep the enemy infantry off the antitank units.

[124]Macksey, 93 - stresses the Germans advantage over the Soviets; Bidwell, 230 - indicates the German advantage over the British.

[125]Gabel, 33.

[126]Bidwell, 215.

[127]Ibid, 215.

[128]Court, 107; see also House, 93.

[129]Weeks, 162.

[130]Ernst Kollewe, "Modernization of the Jaguar 1 Tank Destroyer (Kampfwertstegerung Jagdpanzer Jaguar 1)," Germany: Soldat und Technik, (June 1985): 1; Juergen Zoeller, "Jaguar 2 Tank Destroyer (Jagdpanzer Jaguar 2)," Germany: Soldat und Technik, (1985): 1.

[131]Kollewe, 6-9; Zoeller, 1-8.

[132]Uslar, 52; "Do the Federal Defense Forces Still Need Tank Destroyers," Wehr und Wirtschaft, N4 (April 1969): 8-10; also Krapke, 341.

[133]LTC Wolfgang Hahne, "The Impact of Reunification on the Future of German Armor Forces," Armor, Vol CI no. 2 (March-April 1992): 40-41. Hahne's article outlines the German land forces current design down to brigade level, including 23 mechanized brigades (active and reserve total) of square design - two armor and two mechanized infantry battalions; Briefing from German Liaison Officer to Combined Arms Center, "German Army Structure Number 5," (November 1992). The German LNO's briefing indicates each of these brigades will continue to include a separate Panzerjaeger

(Tankhunters) company of 15 Jagdpanzer Jaguar 1s.

[134]Macksey, 86,93 - initial Soviet lead in 1941; ibid, 95,106 - Germans take lead with Tiger in 1942; ibid, 125 - a mixed year in 1943; ibid, 128,143 - Soviets advantage reestablished in 1944.

[135]Weeks, 118.

[136]Simpkin-Red, 38; see also House, 115.

[137]Macksey, 93,125 - Soviets over Germans; ibid, 94,95,132 - Germans over British and Americans; House,113 - American antitank efforts stretched to the tank destroyers; Weeks, 96 and Simpkin-Antitank, 177 - outline British philosophy of tanks in the antitank role.

[138]COL David M. Glantz, Soviet Defense Tactics at Kursk Combat Studies Institute Report No. 11. (Ft. Leavenworth, KS: Combat Studies Institute, US Army Command and General Staff College, 1986), 3. (Cited hereafter as Glantz-Kursk); see also House, 99, 100.

[139]LTC I. I. Alexeyev, excerpts from Field Artillery Journal, date unknown, as shown in Court, 121-124.

[140]Glantz-Kursk, 13, 20.

[141]Glantz-Kursk, see tables on page 5; COL David M. Glantz, Soviet Force Structure in an Era of Reform (Ft. Leavenworth, KS: Soviet Army Studies Office, US Army Combined Arms Center, March 1989), 26. (Revised; cited hereafter as Glantz-Force Structure Reform)

[142]Glantz-Kursk, 20.

[143]COL David M. Glantz Soviet Use of War Experience: Tank and Mechanized Corps Exploit the Penetration (Ft. Leavenworth, KS: Soviet Army Studies Office, US Army Combined Arms Center, October 1988), 13. (Cited hereafter as Glantz-War Experience); see also House, 186.

[144]Weeks, 150,168-169.

[145]G. Biryukov and G. Melnikov, Antitank Warfare (Moscow: Progress Publishers, 1972), 71; Glantz-War Experience, 13; Simpkin-Red, 36.

[146]Biryukov and Melnikov, 83-84,97; US Army,

Threats Directorate Combined Arms Center, "FM 100-2-1, The Soviet Army Operations and Tactics," Final Draft, (Ft. Leavenworth, KS: Threats Directorate Combined Arms Center, 18 June 1990), p. 9-2.

[147]US Army, FM 100-2-3, The Soviet Army Troops, Organization and Equipment, (Washington, D.C.: Department of the Army, 1991), p. 5-101.

[148]Biryukov and Melnikov, 97-101.

[149]Glantz-Force Structure Reform, 26; LTC Lester W. Grau, The Soviet Combined Arms Battalion-Reorganization for Tactical Flexibility (Ft. Leavenworth, KS: Soviet Army Studies Office, US Army Combined Arms Center, September 1989), 3-12; FM 100-2-1, p. 9-3 to p. 9-6). Grau's work uses wire diagrams to relate the evolution of Soviet motorized/mechanized infantry and tank battalion size units, from WWII to present. The obvious comparison of antiarmor forces in US and Russian infantry fighting vehicle base battalion (BMP and BFV battalions) designs is not valid because the Motorized Rifle Regiment (MRR) level has consistently retained organic antiarmor forces, including those MRRs that are BMP-equipped.

[150]C. J. Dick, The Antitank Reserve and the Mobile Obstacle Detachment (POZ) in Combat (Camberley, England: Soviet Studies Research Centre, RMA Sandhurst, October 1990), 1; see also Court, 121.

[151]Biryukov and Melnikov, 6.

[152]Ibid, 36.

[153]FM 100-2-1, p. 9-1.

[154]Fuller, xi.

[155]Christopher F. Foss, "US Army: The Next Century," Jane's Defence Weekly Vol 16 no. 15 (12 October 1991): 669; Simpkin-Red 54; Weeks 185; House 188. Foss mentions the lack of symmetrical vehicle development of lesser members of the US combined arms teams. Simpkin alludes to the Soviet considerations of this essential trend in looking ahead to their 1990s fleet. Weeks describes the mechanization trends impact on increasing targetry volume and complexities of matching appropriate munitions. House mentions the trend in his summary, stressing that future successful combined arms must keep all arms balanced in mechanization, to include the addition of logistics.

[156]Bidwell, 214, 215 - German and Soviets main battle tanks in WWII; Gavitt, 57 - US post WWII.

[157]Simpkin-Red, 42.

[158]Peter Gudgin, Armour 2000 (London: Arms and Armour Press, 1990), 60,61; Simpkin-Red 50.

[159]K.D. Stubbs, "Beyond the Army of Excellence," Military Review, Vol LXVII no. 8 (August 1988): 30 - Stubbs article called for the use of the dual purpose Air Defense Antitank Systems or ADATS (the program was cancelled earlier in 1992) as the replacement for the ITV; Farndale, 9. Farndale also seems to see a future dual role system - review Endnote# 111.

[160]Gabel, 70 - indicates fulfillment of the WWII tank destroyer doctrine; Simpkin-Antitank, 200 - stresses the multiple roles of the attack helicopter platform, including antitank and general fire support.

[161]John Bondanello, Randall Steeb et. al., An Exploration of Integrated Ground Weapons Concepts for Armor/Anti-Armor Missions (Santa Monica, CA: RAND, 1991), 1. (prepared for Defense Advanced Research Projects Agency - DARPA)

[162]Weeks, 183.

[163]Simpkin-Antitank, 87; Simpkin-Red 53, 54 - on future Soviet tank destroyer or assault gun possibilities; Macksey, 176, 177, 190; Krapke, 341-344.

[164]MAJ David H. Huntoon, "Tank Destroyers...A New Look at Old Doctrine," (Advanced Military Studies Program Monograph, US Army Command and General Staff College, 1987), 25,26, 36; MAJ James A. Cope, "Medium Anti-Tank Defense: The Case for the Return of the Tank Destroyer," (Advanced Military Studies Program Monograph, US Army Command and General Staff College, 1988), 3,4,10,11,31,32. Huntoon on ITVs-25,26; on poor US antiarmor system-26; on tank destroyer battalions at division and corps-36. Cope on ITVs-10,11; on poor US antiarmor system-3,4; on tank destroyers as the medium antitank weapon, including a wheeled company for light brigades -31,32.

[165]Gugdin, 64; Swinburn, 36; Bondanello, Steeb et al, p. v.

[166]Hewish, 1091,1092.

[167]Gugdin, 151.

[168]Swinburn, 35.

[169]Bondanello, Steeb et al, 1.

[170]TRADOC System Manager, Antitank Missiles. "Chief of Infantry Update," Infantry, Vol 82 no. 2 (March- April 1992): 5-6; Glenn W. Jr. Goodman, "Joint Hypervelocity Missile Tests Near: Potential Low - Cost Tank Killer of 1990s," Armed Forces Journal International, 125 (September 1987): 23.

[171]MG Thomas C. Foley, "Armored Force 2000, Part 1," Armor Vol C no. 5 (September-October 1991): 6.

[172]Hewish, 1092; Gerard Turbe, "Antitank Missiles: Improvement vs Replacements - European Collaborative Programs," International Defense Review, 24 no. 10 (October 1991): 1085. Turbe discusses European corporations plans for a hypervelocity missile, possibly the project Farndale had in mind- see Endnote# 159 and 111.

[173]COL George M. Hall, "The Cycle of Military Technology," Military Review, Vol LXVII no. 8 (August 1988): 42,43. Hall defines the cycle; ibid, 46,47. Hall postulates demise of the tank and helicopter.

[174]Simpkin-Red, 150; Gugdin, 134-135.

[175]Foley, 4,5; Bondanello, Steeb et al, 1; Gugdin, 61; Swinburn, 36; Macksey, 190.

[176]Gabel, 72.

[177]Hewish, 1090-1092.

[178]Ibid, 1091,1092; Ludvigsen, 19. Ludvigsen outlines a recent funding cancellation for TSIP, but the program has suffered similar setbacks and been resurgent. The M3 Echo company is a likely top priority if TSIP is reinstated.

[179]Macksey, 95,96. Macksey documents arrival of 75mm Pkw III tanks in North Africa; Gabel, 36. Gabel relates the incident at Sidi-bou-Zid; Message US Army Infantry School, ATSH-B (Commandant), "Echo Company," (DTG 051730Z May 1986), 4. It specifies the primary German killing systems at Sidi-bou-Zid as towed 50mm antitank guns.

[180]Fuller, 17; Court, 89; WWII German Wunsdorf Antitank School doctrine as cited in Court, 116.

[181] Historically each time a significant antiarmor breakthrough occurs the weapon is hailed as the kind of cheap, proliferable, overmatch weapon General McNair always sought. Examples are the pre-WWII antitank gun or initial ATGMs like Egyptian Saggers and US TOWs. But as COL Hall's theory indicates upgrades to the opposing technology (in this case the tank) often deny a head-on overmatch result. Then the weapon must be employed on a flank or rear to achieve the same success. Often the weapon is afforded a maneuver capability as an afterthought. The phenomena described has been quite prevalent in antiarmor weapons. Mobility was a lesser and later consideration, with only some rare wartime exceptions.

[182]FM 100-2-1, 9-10.

[183]Huntoon, 25,26; Cope, 10,11 - both stress the cross country speed and lesser armor protection.

[184]"Echo Company a Vital Player," Infantry, Vol 81 no. 5 (September-October 1991): 14. The article was authored by the Infantry School's Directorate for Combat Developments to address the post-Gulf War spate of ITV-equipped Echo company complaints. It is similar in content to the 1986 message - see Endnote# 77, 179 and also 186.

[185]Goldsmith, 16; Saint, 1; Gibbons 29.

[186]"Vital Player", 13,14. The 1986 message cited in Endnote# 77 owned up to the fact that offensive use of the antiarmor company will require the inclusion of 25mm fires and sometimes tanks. But this never got into FM 7-91 or FM 71-2 as Goldsmith has pointed out. The "Vital Player" article stresses that offensive use of ITV-equipped Echo company will put tanks and BFVs in position for maneuver because they will not have to play an antitank role. Yet when key maneuver BFVs and even tanks get pulled back into the supporting attack business, just to get Echo company safely to the support-by-fire position, the main effort is unduly weakened. Only now, with the M3-equipped Echo company, is the antiarmor based supporting attack-by-fire concept emphasized in both the message and the article, possible without being overly dissipated.

[187]US Army, FM 100-5, Operations, (Washington, D.C.: Department of the Army, 1986), 23,24.

[188]White Paper), 2-4.
[189]Ibid, 5.

[190]Gibbons, 29; Knapp, 30,33; White paper, 2.

[191]Gabel, 61.

[192]See Endnote# 133 on Germans and FM 100-2-1, 9-4 on Russians.

[193]Romjue-"Army 86", 65, 90-93, 128. Romjue discuss a "fixed brigade alternative" (organically designing all normal supporting arms into the brigade) which was closely studied under the Division 86 initiative. Ultimately, however, the Army leadership decided against it and has not changed that position.

[194]Fuller, 43. Fuller's 1943 comment on his 1932 text suggested this idea (pivot of maneuver). He agrees that it is this battlefield effect by antiarmor forces that contributes to the overall unit's maneuver dynamic and thus the combination of arms.

[195]US Army CALL, "DESERT SHIELD/STORM Observations: #DSSN 13 0927 Echo Company as a Brigade asset, dtd 17 March 1991.

[196]MAJ James B. Gunlicks, "Antiarmor Company in the Armor Battalion," (Advanced Military Studies Program Monograph, US Army Command and General Staff College, 1985), 40. Gunlicks' monograph consisted of a series of First Battle engagements by pure, balanced and weighted task forces, with a special focus on a tank battalion with an ITV-equipped Echo company. His results strongly indicated the advantages the TOW company provided the tank battalion. Gunlicks' work is a more recent instance of this argument for the Echo company to be organic to the tank battalion.

[197]Branch parochialism has been visible or just below the surface of most of the Army's discussions on antiarmor:

-1941 tank destroyer formation-see Gabel, 11-15.
-1945 tank destroyer demise-see Doughty, 4-7.
-1956 antitank considerations to support the Pentomic division-see Blinkley-"1939-1961", 34.35.
-1970s concern over an infantry monopoly of antitank force structure - O'Neill-"Tank Destroyers" 38; Doughty and Holder, 20; Ogorkeiwicz, 27; O'Neill-"Doctrine", 24.
-1979 see Starry and Depuy in Endnote #66 and #72.

-1986 the letters cited with Endnote #76 and #77 are good examples.

-1991 Fickett, "Letter to Infantry Magazine: Solving the ITV Problem" (Endnote #85) cites the USAREUR and VII Corps leadership's decision that Echo company would not go to the Gulf War (currently USAREUR no longer has Echo companies).

Given this history, it is remarkable that the Army and TRADOC leadership have elected to continue the antiarmor company in the Army organizational design. Perhaps this decision will at last put to rest some of the branch perceptions of competing interests which seem to be associated with this issue. Implementation of proper doctrine that insures Echo company's routine employment with tank formations, will do much to make that desireable end state possible.

BIBLIOGRAPHY

Books

Army League, Great Britain. The Army in the Nuclear Age: Report of the Army League subcommittee. London: Saint Clements Press, Ltd., 1955.

The British Army in the Nuclear Age. London:Army League, 1959.

Bailey, Charles M. Faint Praise: American Tanks and Tank Destroyers during World War II. Hamden, Conn.: Archon Book, 1983.

Bidwell, Shelford and Dominick Graham. Fire Power: British Army Weapons and Theories of War 1904-1945. Boston, MA: George Allen & Unwin, 1982.

Biryukov, G. and Melnikov, G. Antitank Warfare. Moscow: Progress Publishers, 1972.

Bondanello, John, Randall Steeb et al. An Exploration of Integrated Ground Weapons Concepts for Armor/ Anti-Armor Missions. Santa Monica, CA: RAND, 1991 (prepared for Defense Advanced Research Projects Agency - DARPA).

Court, LTC Geoffrey D.W. Hard Pounding, the Tactics and Techniques of Antitank Warfare with Observations on its Past, Present and Future. Washington, D.C.: US Field Artillery Association, 1946.

Dick, C. J. The Antitank Reserve and the Mobile Obstacle Detachment (POZ) in Combat. Camberley, England: Soviet Studies Research Centre, RMA Sandhurst, October 1990.

Doughty, MAJ Robert W. The Evolution of US Army Tactical Doctrine, 1946-76. Leavenworth Paper no. 1. Fort Leavenworth, KS: Combat Studies Institute, US Army Command and General Staff College, 1979.

Fuller, J. F. C. Armored Warfare. Harrisburg, PA: Military Service Publishing Co, 1943 (Reprinted Westport, Conn: Greenwood Press, 1983).

Gabel, Dr. Christopher R. Seek, Strike and Destroy: U.S. Army Tank Destroyer Doctrine in World War II. Leavenworth Paper no. 12. Fort Leavenworth, KS: Combat Studies Institute, US Army Command and

General Staff College, 1985.

Glantz, COL David M. Force Structure: Meeting Contemporary Requirements. Ft. Leavenworth, KS: Soviet Army Studies Office, US Army Combined Arms Center, 1988. (Also Military Review Dec 1988)

Soviet Defense Tactics at Kursk. Combat Studies Institute Report No. 11. Ft. Leavenworth, KS: Combat Studies Institute, US Army Command and General Staff College, 1986.

Soviet Force Structure in an Era of Reform. Ft. Leavenworth, KS: Soviet Army Studies Office, US Army Combined Arms Center, March 1989 (Revised Edition).

Soviet Use of War Experience: Tank and Mechanized Corps Exploit the Penetration. Ft. Leavenworth, KS: Soviet Army Studies Office, US Army Combined Arms Center, October 1988.

Goldberg, Seymour L. and Theodore C. Mataxis. Nuclear Tactics, Weapons, and Firepower in the Pentomic Division, Battle Group, and Company. Harrisburg, PA: Military Service Publishing Co., 1958.

Grau, LTC Lester W. The Soviet Combined Arms Battalion-Reorganization for Tactical Flexibility. Ft. Leavenworth, KS: Soviet Army Studies Office, US Army Combined Arms Center, September 1989.

Gudgin, Peter. Armour 2000. London: Arms and Armour Press, 1990.

Herbert, MAJ Paul H. Deciding What Has to Be Done: General William E. Depuy and the 1976 Edition of FM 100-5, Operations. Leavenworth Paper no. 16. Fort Leavenworth, KS: Combat Studies Institute, US Army Command and General Staff College, July 1988.

House, CPT Johnathan M. Toward Combined Arms Warfare: A Survey of 20th-Century Tactics, Doctrine and Organization. Research Survey no. 2. Fort Leavenworth, KS: Combat Studies Institute, US Army Command and General Staff College, 1984.

Macksey, Kenneth. Tank vs Tank: The Illustrated Story of Armoured Battlefield Conflict in the Twentieth Century. Topsfield, MA: Salem House Publishers, 1988.

Ney, Virgil. Evolution of the US Army Infantry Battalion: 1939-1968. Ft. Belvior, Va: US Army Combat Developments Command - Combat Operations Research Group, October 1968.

Romjue, John L. From Active Defense to Airland Battle: the Development of Army Doctrine 1973-1982. Ft. Monroe, Va: Historical Office, US Army TRADOC, June 1984.

Simpkin, Richard E. Antitank; An Airmechanized Response to Armored Threats in the 90s. New York, NY: Brassey's, 1982.

Race to the Swift; Thoughts on Twenty-First Century Warfare. London: Brassey's, 1985.

Red Armour. Oxford, UK: Brassey's, 1984.

Tank Warfare. London: Brassey's, 1979.

Soviet Army Studies Office. Soviet Future War Draft Study. Ft. Leavenworth, KS: Soviet Army Studies Office, US Army Combined Arms Center, 27 April 1989.

Weeks, John. Men Against Tanks, A History of Antiarmor Warfare. New York, NY: Mason/Charter, 1975.

Articles

Arielly, CPT Tom. "Doctrine vs Technology - Blueprint for the Future," Armor Vol CI no. 2 (March-April 1992): 29-30.

Betson, CPT Willaim R. "Sidi Bou Zid-A Case History of Failure," Armor Vol XCI no. 5 (November-December 1982): 38-44.

Binkley, 1LT John C. "A History of US Army Force Structuring," Military Review, 57 (February 1977): 67-82.

Brown, MAJ William A. "ROAD Doctrine: Battalion in the Defense," Infantry, (March-April 1962): 32-39.

Burch, CPT Glenn L. and CPT Christopher B. Valentine, "Echo Company," Infantry, Vol 76 no. 5 (September-October 1986): 37-38.

Canby, LTC Steven L. "Regaining a Conventional Military Balance in Europe: Precision Guided Munitions and Immobilizing the Tank," Military Review, Vol LV no. 6 (June 1975): 26-38.

Chamberlain, LTC E. W. "Letter to Infantry Magazine: ITVs in Bradley Units," Infantry, Vol 81 no. 2 (March-April 1991): 3.

Crevecoeur, LTC P. "Striker...Latest of the Tank Destroyers," International Defense Review, 10 (June 1977): 473-474.

Crouch, BG William W. and LTC Thomas V. Morley, "Failed Attacks and Flawed Overwatch: A Lack of Mass and Speed in the Offense," Military Review Vol LXIX no. 6 (June 1989): 14-25.

Donnelly, Christopher N. "Soviet Tactics for Overcoming NATO Antitank Defenses: Part 1," Infantry Vol 70, no. 5 (September-October 1980): 21-26.

"Soviet Tactics for Overcoming NATO Antitank Defenses: Part 2," Infantry Vol 70, no. 6 (November-December 1980): 16-23.

Doughty, MAJ Robert A. and MAJ L. D. Holder. "Antitank Doctrine," Infantry Vol 66 no. 2 (March-April 1976): 16-20.

Directorate of Combat Developments, Infantry Center. "Echo Company a Vital Player," Infantry, Vol 81 no. 5 (September-October 1991): 13-14.

English, LTC John A. "A Historical Perspective on Antiarmor," Marine Corps Gazette, Vol 69 no. 12 (December 1985): 30-37.

Farndale, GEN Martin. "UK Land Forces Role and Structure into the 21st Century," The RUSI Journal, 136 no. 2 (Summer 1991): 7-9.

Fickett, Richard K. "Letter to Infantry Magazine: Solving the ITV Problem," Infantry, Vol 82 no. 3 (May-June 1992): 3.

Foley, MG Thomas C. "Armored Force 2000, Part 1," Armor Vol C no. 5 (September-October 1991): 3-6.

"Armored Force 2000, Part 2,"

Armor Vol C no. 6 (November-December 1991): 4-6.

Foss, Christopher F. "US Army: The Next Century," Jane's Defence Weekly Vol 16 no. 15 (12 October 1991): 669-672.

Foss, COL John W., COL Donald S. Phil and LTC Thomas E. Fritzgerald "The Heavy Division," Military Review Vol LVIII no. 3 (March 1977): 11-21.

Gibbons, CPT Edward G. "Echo Company in a Heavy Task Force," Infantry, Vol 82 no. 1 (January-February 1992): 28-32.

Goodman, Glenn W. Jr. "Joint Hypervelocity Missile Tests Near: Potential Low - Cost Tank Killer of 1990s," Armed Forces Journal International, 125 (September 1987): 22-24.

Hackney, CPT Michael S. "Echo Company: The Fifth Player," Infantry Vol 75 no. 4 (July-August 1985): 20-24.

Hahne, LTC Wolfgang. "The Impact of Reunification on the Future of German Armor Forces," Armor, Vol CI no. 2 (March-April 1992): 37-42.

Hall, COL George M. "The Cycle of Military Technology," Military Review, Vol LXVII no. 8 (August 1988): 42-48.

Hemphill, COL John A. "Reorganization of the Mechanized Infantry Battalion," Infantry, Vol 65 no. 5 (September-October 1975): 18-27.

Hewish, Mark. "US Programs: An Embarrassment of Riches," International Defense Review, 24 no. 10 (October 1991): 1088-1092.

Holder, MAJ L. D. "Tank, Supertank, or No Tank At All," Armor Vol LXXXV no. 1 (January-February 1976): 41-44.

Inge, GEN Peter, "The Land Battle," The RUSI Journal, Vol 137 no. 3 (June 1992): 33-34.

Jefferies, COL Lewis I. "A Blueprint for Force Design," Military Review, Vol LXXI no. 8 (August 1991): 20-31.

Kemp, Ian. "British Defense for the 90s: Less of the Same," Jane's Defence Weekly, 16 no. 3 (20 July

1991): 100-102.

Kemp, Ian. "UK Unveils Army for the 90s," Jane's Defence Weekly Vol 16 no. 5 (3 August 1991): 182.

Knapp, CPT George E. "ECHO on the Battlefield," Infantry, Vol 75 no. 5 (September-October 1985): 30-38.

Kollewe, Ernst. "Modernization of the Jaguar 1 Tank Destroyer (Kampfwertstegerung Jagdpanzer Jaguar 1)," Germany: Soldat und Technik, June 1985 (Unedited translation Charlottesville, VA: Army Foreign Science and Technology Center, July 1986). CARL ADB105814

Krapke, Werner "A Design Concept for a Heavy Tank Destroyer," International Defense Review, Vol 16 no. 3 (March 1983): 341-344.

Lewis, S. J. "Reflections on German Military Reform," Military Review, Vol LXVIII no. 8 (August 1988): 60-69.

Lind, William S. "Some Doctrinal Questions for the United States Army," Military Review, Vol LVIII no. 3 (March 1977): 54-65.

Ludvigsen, Eric. "Army Modernization Skips a Generation," Army, 42 no. 4 (April 1992): 16-23.

Meller, R. "Federal Germany's Defense Potential, Part 1: The Armed Forces," International Defense Review 7 (April 1974): 167-174.

Naumann, GEN Klaus Dieter. "Mission and Structure of the Bundeswehr: The Role in a Changing Security Environment," NATO Sixteen Nations, 36 no. 6 (November 1991): 56-57.

Ogorkiewicz, Richard M. "Anti-Tank Weapons - A Reappraisal," Armor Vol LXXXII no. 3 (May-June 1973): 23-27.

O'Neill, CPT Timothy R. "Needed Now: An Antiarmor Doctrine," Armor, Vol LXXXXV no. 1 (January-February 1976): 18-24.

O'Neill, CPT Timothy R. "Tank Destroyer for the '70s," Armor, Vol LXXXII no. 3 (May-June 1973): 38-43.

Payne, CPT Edward W. "The Army's Key Emerging

Technologies," Armor, Vol CI no. 2 (March-April 1992): 6-12.

Plugge, Matthias. "Bundeswehr in Transition," International Defense Review 24 no.12 (Dec91):1315.

Rhoades, LTC John F. "Is the Tank the Best Defense Against a Tank," Military Review, Vol 31 no. 5 (August 1951): 43-48.

Schonbohm, LTG Jorg. "The New Structure of the German Army," NATO Sixteen Nations, 36 no. 6 (November 1991): 72-85.

Staff, Wehr und Wirtschaft. "Do the Federal Defense Forces Still Need Tank Destroyers," Wehr und Wirtschaft, N4 (April 1969): 196-198 (Unedited translation Charlottesville, VA: Army Foreign Science and Technology Center, 1970). CARL AD871035L

Starry, GEN Donn A. "Combined Arms", Armor, Vol LXXXXVII no. 5 (September-October 1978): 21-22.

Stubbs, K.D. "Beyond the Army of Excellence," Military Review, Vol LXVII no. 8 (August 1988): 24-41.

Swinburn, LTG Sir Richard. "Future Armoured Warfare: The Case for the Tank," The RUSI Journal, Vol 137 no. 3 (June 1992): 35-37.

Theis, Wallace J. "A Twenty First Century Army," Parameters, 21 no.1 (Spring 1991): 62-76.

Turbe, Gerard. "Antitank Missiles: Improvement vs Replacements - European Collaborative Programs," International Defense Review, 24 no. 10 (October 1991): 1085-1088.

TRADOC System Manager, Antitank Missiles. "Chief of Infantry Update," Infantry, Vol 82 no. 2 (March-April 1992): 5-6.

Uslar-Glichen, COL Hans von. "AntiTank Warfare," Armor Vol LXXIV no. 6 (November-December 1965): 51-52.

Zoeller, Juergen. "Jaguar 2 Tank Destroyer (Jagdpanzer Jaguar 2)," Germany: Soldat und Technik, 1985 (Unedited translation Charlottesville, VA: Army Foreign Science and Technology Center, July 1986). CARL ADB105699

Government Publications

US Army. FM 100-5 Operations. Washington, D.C.: Department of the Army, 1986.

US Army. FM 71-2 The Tank and Mechanized Infantry Battalion Task Force. Washington, D.C.: Department of the Army, 1988.

US Army. FM 100-2-3 The Soviet Army Troops, Organization and Equipment. Washington, D.C.: Department of the Army, 1991.

US Army. "FM 100-2-1 The Soviet Army Operations and Tactics (Final Draft)." Ft. Leavenworth, KS: Threats Directorate Combined Arms Center, 18 June 1990.

US Army. "FM 100-5 Operations (Preliminary Draft)." Ft. Monroe, VA: Headquarters Training and Doctrine Command, 21 August 1992.

Unpublished Dissertations, Theses and Papers

British Army. "Staff Officers Handbook," D/DAT/13/38/54, 1988.

Blinkley, CPT John C. "History of US Army Force Structuring 1939-1961 - In Support of Div 86 Study (Draft)," Ft. Leavenworth, KS: Combat Studies Institute, Command and General Staff College, August 1979. CARL N 20326.1

Cope, MAJ James A. "Medium Anti-Tank Defense: The Case for the Return of the Tank Destroyer," Advanced Military Studies Program Monograph, US Army Command and General Staff College, 1988. CARL ADA207971

Davis, LTC Richard E. "TOW Doctrinal Deficiencies," Carlisle Barracks, PA: Army War College, 16 Apr 1982. CARL ADA116183

Depuy, GEN William E. "Division Restructuring Study Outline," Ft. Monroe, VA: Office of the Commanding General, US Army TRADOC, 17 June 1976. (General Depuy's handwritten outline to the TRADOC DRS Study Group) CARL ARCHIVES 02/001/001

Gavitt, MAJ James S. "Considerations for the Distribution of Antiarmor Weapons," Master of Military Arts and Science Thesis, US Army Command

and General Staff College, 1985. CARL ADA164799

Goldsmith, Martin "TOW Missile System Utilization at the National Training Center" Santa Monica,CA: Arroyo Center RAND Corporation, October 1990. (prepared for Combined Arms Training Activity- CATA)

Gunlicks, MAJ James B. "Antiarmor Company in the Armor Battalion," Advanced Military Studies Program Monograph, US Army Command and General Staff College, 1985. CARL ADA167682

Harned, MAJ Glenn M. "The Principles of Tactical Organization and their Impact on Force Design in the US Army," Advanced Military Studies Program Monograph, US Army Command and General Staff College, 1985. CARL ADA167707

Holley, J. and S. Fries. "Organization, Equipment, and Tactical Employment of Separate Tank Battalions," Study 50 of the General Board, US Forces European Theater, 1946. CARL 12875.50

Huntoon, MAJ David H. "Tank Destroyers...A New Look at Old Doctrine," Advanced Military Studies Program Monograph, US Army Command and General Staff College, 1987. CARL ADA192584

Kibler, A. "Organization, Equipment, and Tactical Employment of Infantry Division," Report 15 of the General Board, US Forces European Theater, 1946. CARL 13032.15

Kibler, A. Samuel Conley and Richard Stilwell. "Types of Divisions, Post War Army," Report 17 of the General Board, US Forces European Theater, 1946. CARL 13032.17

Magee, Ronald G. and Tarkowski, Henry L. "Analysis of the Division Restructuring Study Phase I War Games Technical report TR1-77, Vol 1, Main Report and Appendices I-III," Ft. Leavenworth, KS: Directorate of Combat Operations Analysis, US Army Combined Arms Combat Development Activity- CACDA, January 1977. CARL ADA038784

Pattison, MAJ Jack E. "The Combat Support Company...Rising From Its Own Ashes," Advanced Military Studies Program Monograph, US Army Command and General Staff College, 1989. CARL ADA210971

Romjue, John L. "A History of Army 86, Vol 1: Division 86: The Development of the Heavy Division, September 1978 - October 1979" Ft. Monroe, VA: Hq TRADOC, June 1982. CARL ADB 074961L

Stilwell, General Joseph W. "Report on War Department Equipment Board, 19 Jan 1946," Fort Leavenworth, KS: U.S. Army Command and General Staff College, 1946. CARL 12960

US Army CACDA. "Division 86-Final Report (ACN 36801)," Ft. Leavenworth, KS: Combined Arms Center Development Agency, 1981 w/ 1983 addendum. CARL ADB082875L

US Army CACDA. "Division Restructuring Evaluation - Independent Report - Maneuver Battalion Phase, Vol I Executive Summary," Ft. Leavenworth, KS: Force Structure and Design Directorate, Combined Arms Center Development Agency - CACDA, September 1978. CARL N18968.283

US Army CACDA. "Division Restructuring Study Evaluation - Independent Evaluation Report - Brigade Phase, Vol I Executive Summary," Ft. Leavenworth, KS: Force Design Directorate, Combined Arms Center Development Agency - CACDA, December 1979. CARL ADB062399L

US Army CACDA. "Division Restructuring Study Evaluation - Independent Evaluation Report - Brigade Phase, Vol VI (Phase III Organization Development)," Ft. Leavenworth, KS: Force Design Directorate, Combined Arms Center Development Agency - CACDA, December 1979. CARL ADB043978L

US Army CALL. "DESERT SHIELD/STORM Observations #DSSN 13 0927 Echo Company as a Brigade asset, dtd 17 March 1991; #DSSN 12 0868 M901 ITV, 17 March 1991; #214, #215 Improved TOW Vehicle & #228, #265 Antiarmor Company, 19 March 1991; #DSSN 13 0962 Combined Arms Maneuver Battalion (CAMB) Issues, undated," Saudi Arabia and Ft Hood Trip Report: Center for Army Lessons Learned-CALL; CARL files.

US Army European Command. "Infantry Organization and Equipment Based on German Experiences in Russia," Historical Division, European Command, July 1951. (English copy. Personal experience of Generalmajor Hellmuth Reinhardt and other field commanders) CARL N17681

US Army TCATA. "Test Report FT 382A: Division Restructuring of the Heavy Divison, Phase II Brigade Test, Final Report," Ft. Hood, TX: Hq, TRADOC Combined Arms Test Activity, May 1979.

US Army CACDA. "Final Report - The AOE Heavy Division, Vol III," Ft. Leavenworth, KS: Combined Arms Combat Development Agency, 1984. CARL N18968.309L

US Army TRADOC. "Division Restructuring Study, Phase 1 Report, Vol I Executive Summary," Ft. Monroe, VA: Division Restructuring Study Group Hq TRADOC, March 1977. CARL ADA 038784

US Army TRADOC. "Division Restructuring Study, Phase 1 Report, Vol III Test and Analysis," Ft. Monroe, VA: Division Restructuring Study Group Hq TRADOC, March 1977.

US Army Infantry School. "White Paper: Bradley Equipped Echo Company," Ft. Benning,Ga: Infantry School, undated. (Faxed to CAC FDD 29 June 1992)

Unpublished Correspondence

Briefing from German Liaison Officer to Combined Arms Center. "German Army Structure Number 5," November 1992.

Letter from MG Edwin H. Burba, Commandant US Army Infantry School, to LTG General Crosbie E. Saint, Commander III Corps and Ft. Hood, Texas, 18 August 1986.

Letter from LTG Crosbie E. Saint, Commander III Corps and Ft. Hood, Texas, to MG Edwin H. Burba, Commandant US Army Infantry School, 30 December 1986.

Memorandum from Chief of Staff of the Army (GEN Carl Vuono) to LTG Reimer (Deputy Chief of Staff for Operations), "The Bradley Battalion Structure," 31 January 1991.

Memorandum from US Army Infantry School Assistant Commandant (BG Carl F. Ernst) to Commander US Army Combined Arms Command "Echo Company," undated (Faxed to CAC FDD 2 October 1991).

Message US Army Infantry School, ATSH-B(Commandant), Subject: Echo Company, DTG 051730Z May 1986.

Message Headquarters Department of the Army, DAMO-FDD (Deputy Chief of Staff for Operations, Force Design Division), Subject: Documentation of BFVs in Bradley Echo Company, DTG 071313Z July 1992.